1931 Vol. XLVIII DECEMBER 27th, 1945

ADEL PRECISION PRODUCTS CORP.
LIBRARY

FLIGHT

and

AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB ONE SHILLING

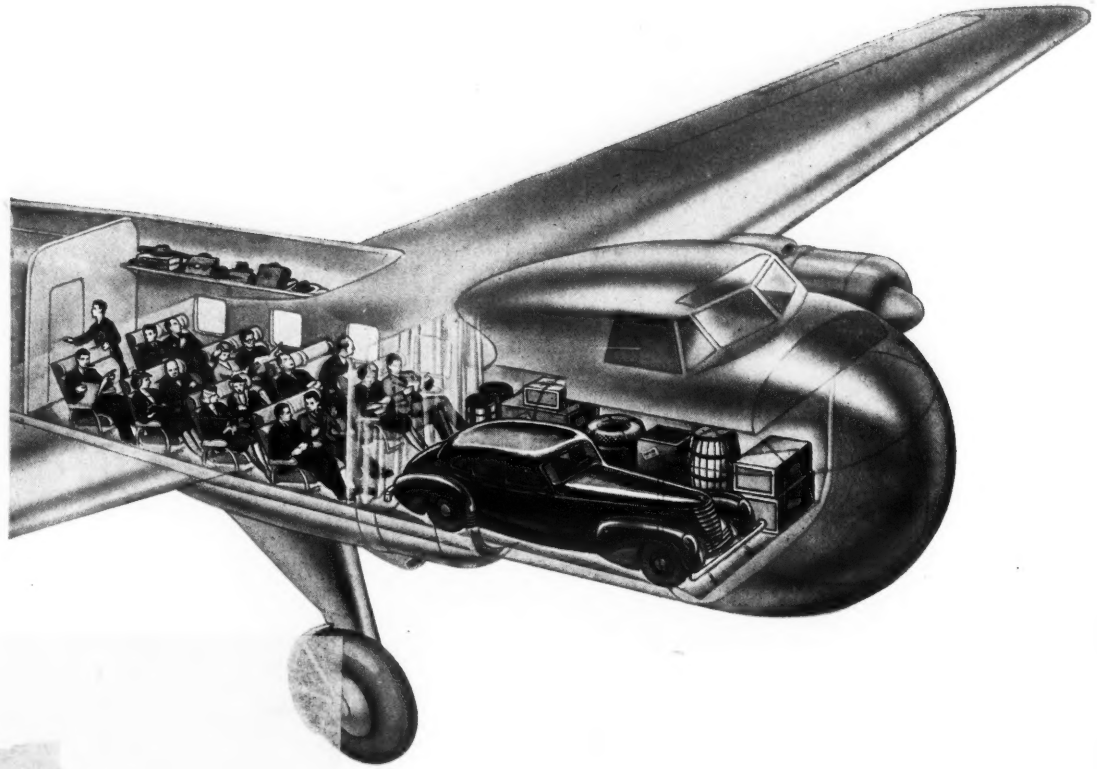
Desford Trainer

Major Series I Engines and Henderson Safety Fuel Tanks, also embodying
the whole of "ab initio" and "intermediate" stages of flying training

R E SIGRIST LTD

Versatility . . .

With design versatility making it readily adaptable to any specialised service or project, the "Bristol" Freighter puts luxury air transportation within the financial range of an entirely new strata of potential users. The FREIGHTER version of Type 170 has readily detachable seating for up to 40 passengers . . . providing variable accommodation for differing ratios of combined passenger/cargo payload, thus giving the aircraft optimum versatility. This, combined with inherent features ensuring operational economy and minimum maintenance, makes the Freighter the soundest aircraft proposition for popular air-travel and cargo-carrying.



BRISTOL AEROPLANE COMPANY LIMITED

FLIGHT
and
AIRCRAFT ENGINEER

First Aeronautical Weekly in the World : Founded 1909

Editor
C. M. POULSEN

Managing Editor
G. GEOFFREY SMITH, M.B.E.

War Correspondent
JOHN YOXALL

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams : Truditur, Sedist, London. Telephone : Waterloo 3333 (35 lines).

COVENTRY :	BIRMINGHAM, 2 :	MANCHESTER, 3 :	GLASGOW, C.2 :
8-10, CORPORATION ST.	GUILDHALL BUILDINGS, NAVIGATION ST.	260, DEANSGATE.	26B, RENFIELD ST.
Telegrams : Autocar, Coventry.	*Telegrams :* Autopress, Birmingham.	*Telegrams :* Iliffe, Manchester.	*Telegrams :* Iliffe, Glasgow.
Telephone : Coventry 5210.	*Telephone :* Midland 2971 (5 lines).	*Telephone :* Blackfriars 4412.	*Telephone :* Central 4857.

SUBSCRIPTION RATES : Home and Abroad : Year, £3 1 0. 6 months, £1 10 6.

Registered at the G.P.O. as a Newspaper.

No. 1931. Vol. XLVIII. December 27th, 1945 Thursdays, One Shilling.

The Outlook

Let Us Have Confidence

IT was almost inevitable that, after a long and tiring war, there should be a tendency for people to develop a cynical and even defeatist attitude about everything from international politics to their own private affairs. Such a "tired" effect is, however, of immense danger even to a democratically minded nation since, while looking round for a stronger light in the prevailing drabness of unenthusiastic mediocrity, people are inclined to find hope in an "ism" of some kind. And the only certain escape from a catastrophe of this kind lies in individual enthusiasm.

Civil aviation seems to be suffering, at present, more than any other "industry" from the effects of a universal jeremiad. Of course the Americans have more civil aircraft and a more thoroughly organised airline system, but that might have been expected. Yet it would be wrong to say that all these services are being run with modern types. Most of them are operated with aircraft which were being used in pre-war years, and even America's new and better aircraft are only just now coming along.

The necessary confident spirit in which the whole situation should be approached was exemplified in a letter from Sir Roy Dobson, of Avros, recently published in *The Daily Telegraph* as a reply to somewhat depressing statements about our civil aviation position *vis-à-vis* that of America.

Sir Roy made it quite clear that he himself felt no such depression, and gave facts and figures to show that his own firm, apart from any others, would soon be producing up-to-date civil aircraft. He explained that the Tudor I, designed solely for Atlantic operations, would carry 24 passengers on this service and was now ready for delivery. Both this and the Tudor II, a 40-60-passenger aircraft, are pressurised and in every way as up to date as anything appearing on the other side of the Atlantic. In addition, we have the Lancastrian, now arranged as a 13-seater, completing the London-Sydney run in a time shorter than that possible with any other aircraft in the world. The York, too, though "dated" by modern ideas, is being used in large numbers and is a more modern and, in many ways, more satisfactory civil aircraft than those used at present by the American operators.

So much for the Jeremiahs.

Test Training

IN these days, when aircraft performance is tending to outrun theory and when development costs are so high, it would be impossible to over-emphasise the importance of the work of the technically minded test pilot. We cannot have available too many pilots with a fundamental understanding of, and practice in, the best routine-testing methods for use with different types, including the various checks of handling and performance involved. Not only are experienced test pilots always needed in the usual way for development and production flying in the industry, but they will still, presumably, be needed for Maintenance Units, and might even be attached to Service stations or squadrons for routine post-overhaul check and acceptance testing. An effective and experienced test pilot can save an immense amount of time, labour and plain cash in prototype production and post-overhaul checking.

Until comparatively recently the qualities which combine to make a sound test pilot could only be obtained by slow stages and as a result of long experience. Even now experience is still a vital adjunct to any knowledge and practice. No newcomer, however proficient, can quickly replace those who have gained the necessary background knowledge in the long and sometimes hard

school of continuous experience. But at least, with the work of the Empire Test Pilots' School, a supply of basically qualified test pilots can now be guaranteed. We hope this School will in future be given all the support and encouragement possible, since it will play a vital, however indefinite, part in the future of British aircraft design and production.

Lord Winster's Pink Paper

WHEN Lord Winster announced the Government's civil aviation policy in the House of Lords on November 1 we made our views abundantly clear. We have no faith whatever in national ownership of a form of transport in which speed in every form counts for so much—speed of aircraft on the routes, speed of getting going, and speed of decision. There is nothing in the White Paper issued on December 20th to cause us to change our views. We still do not believe in nationalisation, but the present Government was put in by a misguided electorate with such powers that it is fairly useless to keep crying over spilt milk. As we said a week or two back, the most that can be done now is for everyone concerned to do his (and her) utmost to make the best of a bad job.

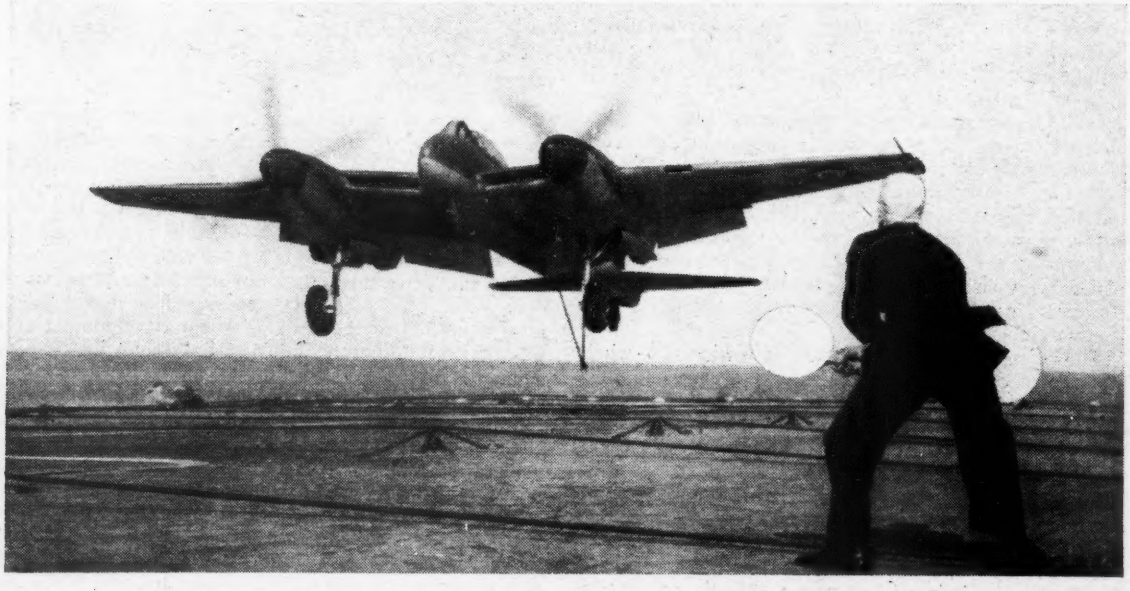
The White Paper changes none of the main features outlined by Lord Winster, and it adds little to them except in minor detail. One finds here and there traces of a desire by the Government to "soft-soap" various critics and interests, and the inference that after all there are no very great differences between the Swinton and Winster White Papers is rather reminiscent of the servant girl's baby. Nationalisation, or the complete absence of any sort of rivalry, is still the objectionable feature of the whole set-up, compared with which the similarities with the Swinton scheme are a very small baby indeed.

Bearing in mind the inescapable fact that we shall somehow have to make the scheme work, the best hope appears to lie in the selection of members to the boards of the three corporations. A very great deal will depend upon the men to whom is to be entrusted the detail working of the operating companies, and we do urge all who can bring any influence to bear to do all they can towards ensuring that men of real experience (and not exponents of the arts of running greyhound races and multiple shops) are put on the boards. Otherwise, we shall have three top-heavy monopoly companies instead of three corporations in which the men at the top know from experience the problems and difficulties of those who have to do the slogging daily work. Given the right men on the three boards, it may be possible to avoid catastrophe. Given the wrong men, British civil aviation is *finished*. Lord Winster has it in his power to make or mar his scheme by the judgment he exercises in making these appointments. He has a very good example of how not to do it in the existing monopoly company.

One curious fact is that although in his November 1st speech Lord Winster said the White Paper would have to wait until he had had conversations with the surface transport interests, no mention of these is made in the Paper, from which fact one is almost driven to the conclusion that the conversations have not been very fruitful—from the Government's point of view.

CONTENTS

The Outlook	669
Gas Turbine Problems	671
Here and There	674
Last of the Biplane Fighters	676
Preparing for Nationalisation	678
Operation "Deadlight"	679
New Gipsy Engines	680
The Year That Has Passed	683
America Misunderstands	689
Civil Aviation News	690
Correspondence	691
Service Aviation	692



FOR THE FIRST TIME: The D.H. Sea Hornet (F Mk. XX) making its first landing on one of our new Light Fleet Carriers. Handed airscrews are fitted to avoid swing during the take-off or landing on the restricted space of a flight deck. The pilot's view of the deck is well-nigh perfect, although the engines on the wing do tend to interfere with his view of the batsman. In that respect the jet-propelled Vampire which recently made its first deck trials is distinctly superior.

Gas Turbine Problems

Dr. Roxbee Cox on Some of the Troubles Encountered in Jet Development and How Solutions Were Reached

THE subject of gas turbines is one of never-ending interest. In the whole history of flying there has been nothing comparable with this spectacular development, which promises to revolutionise many aspects of aviation, both military and civil. Last week we published certain sections from the Wright Brothers lecture delivered by Dr. Roxbee Cox to the American Institute of the Aeronautical Sciences on December 17th, in which were outlined some of the outstanding achievements of the British aircraft industry in this field. This week we deal with some aspects of development and research which have resulted in most of the initial problems being solved. Following are extracts from this section of Dr. Roxbee Cox's lecture.

Bearings were the source of a number of failures. Ball, roller and Michell bearings all had their adherents. It would be dangerous to suggest that a general solution was found, but success is associated with seating designed to withstand mounting distortions, with the correct (and considerable) diametral and axial slackness in ball bearings and limitation of bearing temperatures by careful cooling. The majority of designers incline to ball bearings, some preferring roller bearings at the turbine end of the shaft. Lubrication has proved less difficult than was expected in the early days, and solid lubrication, as distinct from lubrication with an atomised spray, with oil of relatively low viscosity, is the common practice.

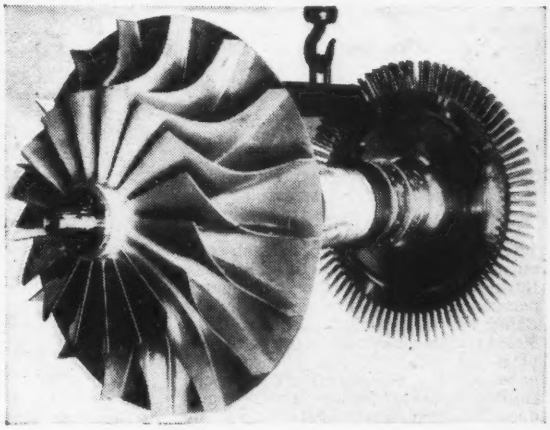
Sheet-metal Construction

All the engines so far have employed sheet metal construction for the bulk of the combustion system, and this sheet metal was at one time a prolific source of failures. These resulted from inadequate experience of resistance welding, from fatigue and fretting due to aerodynamic and mechanical buffeting, and from oxidation through contact with flame or distortion due to bad temperature distribution.

The first type of failure was eliminated by study of and experience in resistance welding, the correct choice of material, and careful attention to finish.

Fatigue and fretting failures have been eliminated by removal or diminution in the sources of vibration, by stiffening or other forms of redistribution of material, by the careful design of corners and junctions, and by locating components to allow freedom for expansion whilst retaining sufficiently accurate positioning. In certain designs, the problem of fretting has been dealt with by arranging small air gaps at the susceptible junctions; this has had no ill-effect on performance.

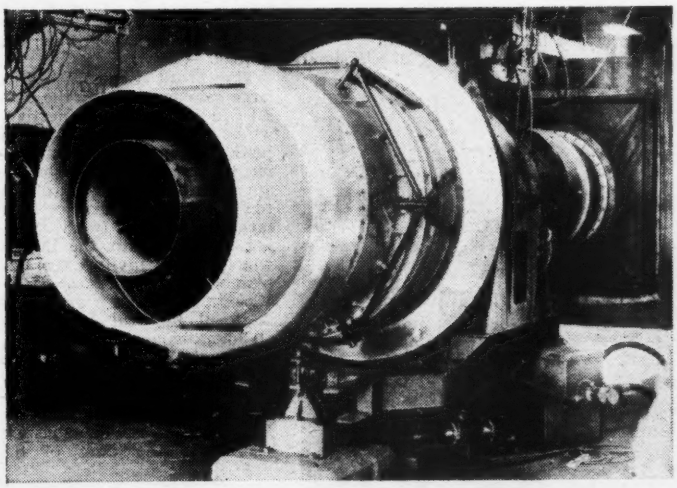
Failures from flame or poor heat distribution were common in the flame tubes of the early Whittle-type engines, but they have almost disappeared now that combustion chambers have been developed with no thin metal parts in the flame region, and the control of the fuel injection has been improved. The annular combustion chamber is still, however, subject to thermal distortions and cannot yet be regarded as satisfactory.



The rotor of the Halford H.1 engine, which used a single-sided impeller and a "straight-through" combustion system.

Sources of Impeller Failures

A serious crop of impeller failures was experienced as the engine ratings were increased. Investigation showed that in the early engines these had been avoided more by good fortune than by good judgment, as it was discovered that the failures were attributable to resonant vibrations excited by aerodynamic impulses from the diffusers. After much theoretical and empirical work, designs were evolved which proved to be satisfactory. From these, more precise data have been obtained and impellers can now be successfully designed with confidence. The achievement of a satisfactory impeller was delayed through pilots and test personnel instinctively avoiding the resonant frequencies because they found the corollary noise to be uncomfortable.



The Metropolitan-Vickers F.3 ducted fan thrust augmenter, bench-testing of which has given most promising results.

The development of the appropriate high-temperature steel for turbine blading at the Firth Laboratories under Dr. Hatfield was one of the major factors which made the aircraft gas turbine possible, and the development of the engine has been accompanied by developments in the materials of construction. At one time, turbine blade failures were unfortunately common. Today, they are a rarity. Accuracy in manufacture, avoidance of small radii at root junctions, sound stressing methods, understanding of turbine vibration problems as well as improvements in material, have all played their parts in the elimination of failures.

The outstanding blading material developed for the British engines is Nimonic 80. This material was discovered by the Mond Nickel Company in 1940, soon after they had discovered Nimonic 75, which is particularly suitable for combustion parts. Nimonic 80, with its excellent creep and fatigue properties at the working temperature, is sufficiently easily forged at about 1,100 deg. C. to permit blade blanks to be stamped practically to finished size. It is now the standard material for turbine blading in British engines.

A number of failures of turbine discs and rims has been experienced, but now the likelihood of failures of this kind is small. This is due not only to improvements in the design of gas seals and the

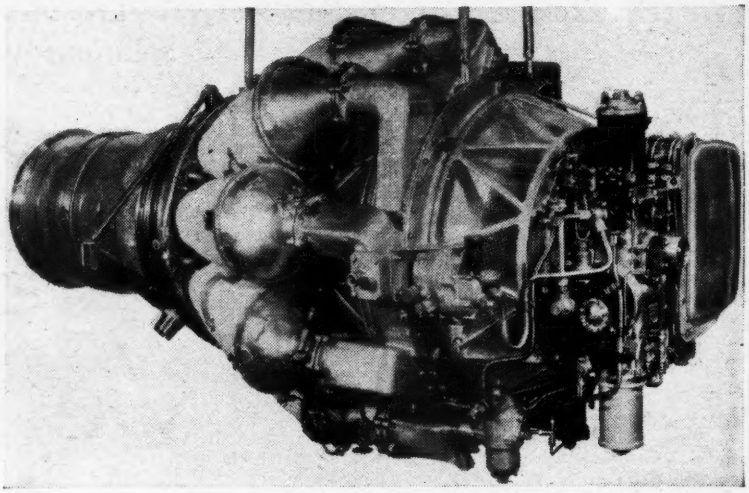
GAS TURBINE PROBLEMS

arrangements for disc cooling, and in the provision of better materials, but to the extension of knowledge of stress effects. In the gas turbine disc, the presence of high temperature and steep temperature gradients means that high stress may be accompanied by plastic strain. The stress distribution departs from the predictions of elastic theory, there is high residual stress when cold, and the natural vibration frequencies are functions of the stress conditions. Also, the cycles of strain and temperature modify the stress-strain characteristics of the material, in which there may be structural changes. The Gas Turbine Collaboration Committee determined upon a thorough exploration of the disc problems and appointed a special sub-committee* for the purpose. In addition to theoretical investigations, valuable experimental research is being done by Dr. Bailey in the research department of the Metropolitan-Vickers Company to explore quantitatively the phenomena I have noted. For this work a special electrically-heated furnace is used to produce required stress distributions by applying known temperature gradients.

Each gas turbine firm has had its own group of workers in research or, probably more accurately, in that broad belt wherein research and development are indistinguishable. In addition, there has been at all times a large group engaged in general problems, correlative and advisory work. This is the group, led in recent years by Mr. Hayne Constant, whose pioneer work in axial compressors at the Royal Aircraft Establishment I have already noticed. To-day they form part of the organisation known as Power Jets (Research and Development) Limited.

The broad treatment of a large canvas which at the outset I indicated as my objective, whilst it should do rough justice to engineering achievements, is less suited to an appreciation of the work of the research teams. I may perhaps mention, however (without being tempted into the details which they invite) the researches by Mond Nickel, Firth-Vickers, Jessops and the National Physical Laboratory on high-temperature materials; the work by the Power Jets team on burners; the work by Power Jets (Research and Development), Lucas and de Havilland teams on combustion technique; the work of the

* Dr. S. L. Smith, Dr. R. W. Bailey, Dr. Ker Wilson.



The Rolls-Royce Derwent V engine was used in the Gloster Meteor which established a world speed record of 606 m.p.h.

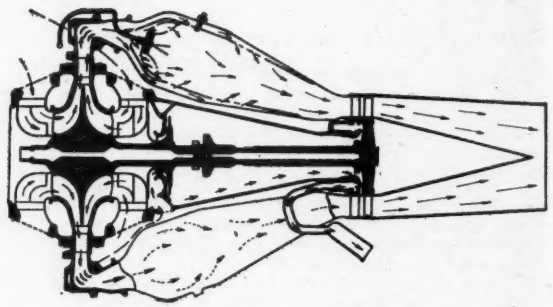


Diagram of the "straight-through" arrangement originally demonstrated on the Halford H.1 engine.

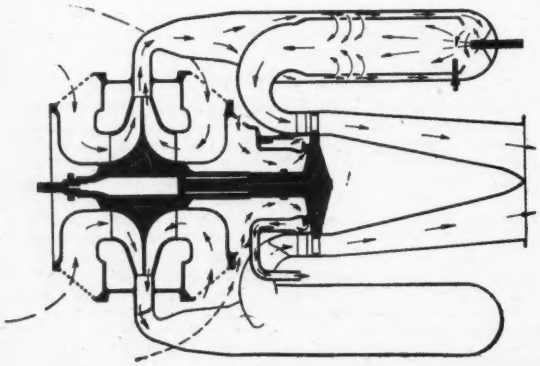
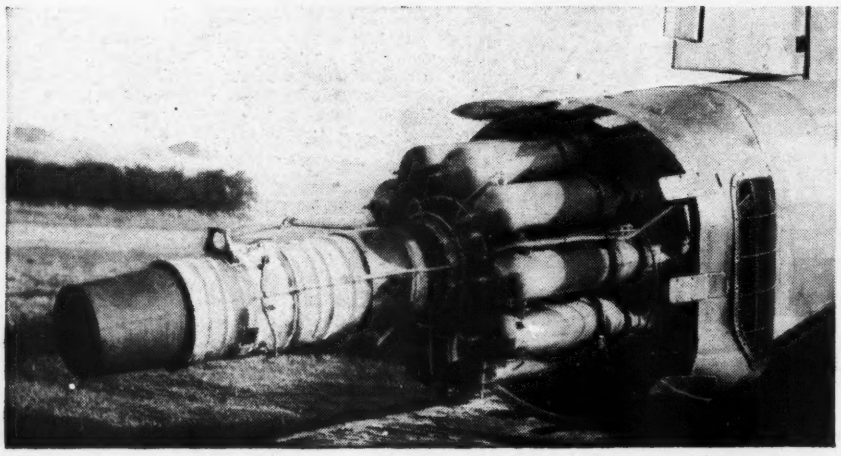


Diagram of the "return-flow" combustion system of the classic Whittle engine.

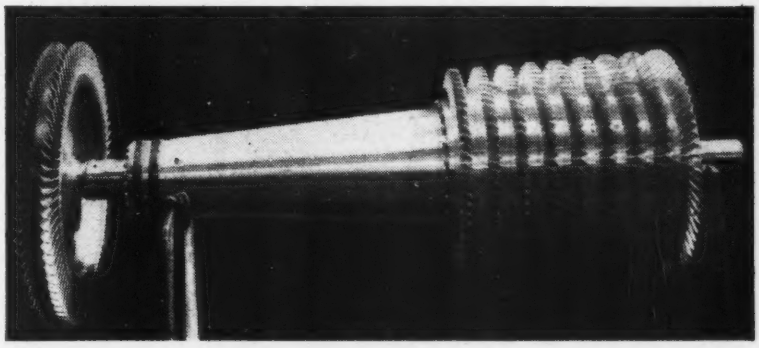


The Vickers Wellington flying test bed with W2/700 engine.

GAS TURBINE PROBLEMS

Asiatic Petroleum Company and the Combustion Panel on the physics of combustion, the work by Constant's team on gas analysis, on blade vibration, and on blading design.

From this last group, I propose to mention as an example of general experimental research of the kind designed to anticipate difficulty, the work done in collaboration with Armstrong-Siddeley on the effect of axial spacing of blading. Whereas when the early axial compressors were being designed we thought it necessary to allow between fixed and moving blade rows an axial distance equal to at least one-third of the blade chord, now, as the result of experiment with a compressor in which blading spacing can be varied, we conclude that the closer together the blade rows are spaced, the better.



Rotor of Metropolitan-Vickers F.2 engine, which has a nine-stage axial-flow compressor, a single annular combustion chamber, and a two-stage turbine, all on the same axis.

The story of combustion development deserves some special notice, as of the many problems presented by the design of the aircraft gas turbine, the combustion problem was probably initially the most critical. Although there was as a background an established technique of oil burning, the special problems of the aircraft gas turbine demanded a new approach, since the engine's performance is extremely sensitive to the pressure loss through the combustion chamber, and, above all, the weight and volume of the chamber must be small. There was no question of starting development with a spacious brick-lined chamber, such as is used for raising steam. From the outset, combustion systems have been schemed in light-gauge sheet metal and, in addition to efficiency and pressure-loss considerations, prevention of overheating and mechanical failure were matters of prime consequence.

The original Whittle unit was built with one large combustion chamber and the early trials were done with liquid injection, the burners being of the low-dispersion pencil type. Combustion was unsatisfactory and at an early stage Whittle introduced the technique of vaporising the fuel before injection into the chamber; for some time, however, unsatisfactory combustion continued to limit engine running.

Important Combustion Factors

Looking back, two events stand out in the story of the development of successful combustion for the Whittle engine. The first was the sub-division of the combustion into ten separate chambers, which appeared in the second reconstruction of the first Whittle engine. The great advantage obtained with this arrangement was that a single chamber could be individually tested with a relatively small air supply, and developed on a test rig to a point where it could be applied to the engine with every chance of success.

The second notable event was the advent of the burner due to Mr. I. Lubbock, of the Asiatic Petroleum Company, which gave a very finely atomised spray of liquid fuel over the wide range of output required. Although with the vaporisers which were embodied in the unit as reconstructed with ten separate combustion chambers, the combustion itself reached a relatively satisfactory stage, development was held back by the mechanical failure of the vaporising apparatus, chiefly on account of overheating and blockage of the vaporising tubes, which were contained in the flame tube and subjected to irregular heat distribution.

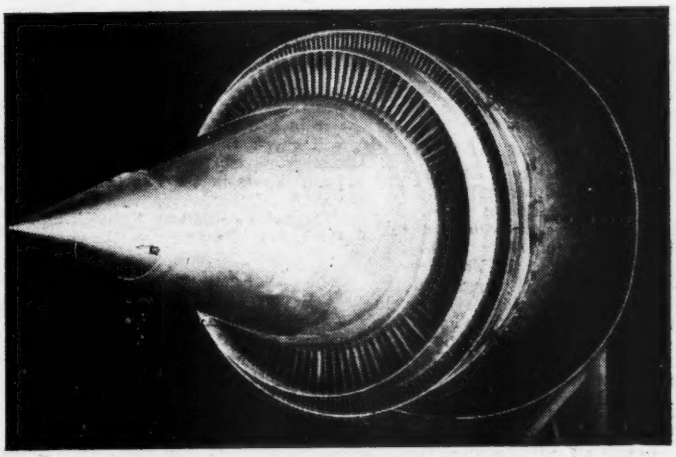
The introduction and development of the Lubbock burner quickly led to the first set of combustion equipment to allow engine running of any duration. The engine for the first flight of the E.28/39 aircraft was equipped with Lubbock type burners operating in a swirl-type combustion chamber developed by Power Jets Limited, and this system formed the basis of most of the subsequent combustion system designs.

Up-stream Injection

During these early days, the Royal Aircraft Establishment had been doing work on the combustion problem, and developed a type of chamber based on the original low-dispersion jet, injecting into the air in an up-stream direction. This was later taken over by Metropolitan-Vickers for their annular chamber, and a combustion system of this type is now being used in the F.2 units.

When the Rover Company were engaged in the production of the W.2-type engine, Messrs. Lucas, who were supplying the combustion equipment, started a combustion test department which has since grown and now does a considerable part of the combustion development and supply of components for several manufacturers of aircraft gas turbines. Lucas's chief contributions have been in the development of the so-called "straight-through" multi-chamber combustion system.†

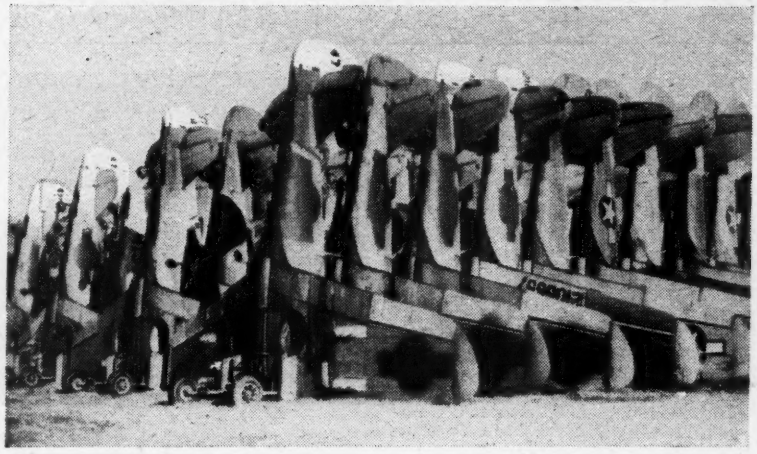
With the interest in combustion problems spread to several centres, the Gas Turbine Collaboration Committee set up a sub-committee, known as the Combustion Panel, in July, 1942. This was under the chairmanship of Professor Lancer, of the Imperial College of Science and Technology, and was composed of combustion specialists from Asiatic Petroleum, Lucas, Power Jets and the Royal Aircraft Establishment, together with members from the universities and research organisations. This Panel provided means for consultation, for laying-down general lines of research on common problems, and for guiding this work and preventing overlapping. A large portion of its work has fallen into a study of the properties of injectors in respect of design data and measurement of performance, and in particular the measurement of the particle sizes of the atomised spray. Other investigations it has co-ordinated are a study of carbon formation and methods of mixing.



Power Jets experimental ducted fan for W2/700 engine.

† An article on the research work carried out by Joseph Lucas, Ltd., in this field will be found on p. 675 et seq of this issue.—Ed.

HERE AND THERE



THE LAST LINE-UP : Parked with an orderly economy of ground space, these obsolete P-40 fighters of the U.S.A.A.F. are among thousands of wartime aircraft stored at an American base at Walnut Ridge, Ark, awaiting breaking up for salvage.

Arbroath Air School

THE first permanent training school for Naval air artificer apprentices is to be established in the New Year at Arbroath, Angus, Scotland, which is one of the largest Naval air stations in Britain.

During the war this station, as H.M.S. *Condor*, was the training school for naval pilots in deck landing, and the observers' training centre.

The course for air artificers will take four years, the last six months of which will be spent getting practical experience on a Fleet Air Arm station.

Engines on Show

AN exhibition of British aircraft engines was held recently at the Metropolitan-Vickers Aircraft Factory, Trafford Park, Manchester. Divided into three sections—piston engines and radial-flow and axial-flow jet units—the exhibits included (in the first section) a cut-away " working " Napier Sabre, and in the second a Rolls-Royce Derwent V—the type used in the Gloster Meteor which broke the world's speed record. The third category featured a Metropolitan-Vickers E.2 Series 4 engine alongside, for purposes of comparison, two other axial-flow units, the German Junkers Jumo 004 and B.M.W. 003. The Gloster E.28/39 was also on view.

Renaissance

THE *de Havilland Gazette*, suspended during the war years, has made a most effective reappearance in the form of a special post-war number combining a review of the firm's history with a summary of its war effort.

Not only is this special issue beautifully produced, but it contains some interesting sidelights on the development of the Goblin jet engine, including the fact that it was one of these D.H. units that powered the first Lockheed to exceed 500 m.p.h. (a point omitted from the U.S. publicity matter on the subject), and a comprehensive table showing wartime production and repair output figures.

Modellers' Mecca

MR. D. A. RUSSELL and his staff of *The Aeromodeller* are to be heartily congratulated on the excellence of the Second National Model Aircraft Exhibition which was opened by Vice-Admiral Sir Dennis Boyd in Dorland Hall, Lower Regent Street, London, W.1, last week.

Some 2,000 models, ranging from small solids to sailplanes and petrol-driven flying models with a span of several feet, were unpacked and arranged within the space of three days—the larger types also had to be assembled—and the total value of the exhibits has been put at £25,000.

It was stressed by Sir Dennis that model aircraft are not toys, and this exhibition reflects so well the strides made in model aircraft engineering that nobody could retain any such delusion after a visit. Indeed, Lord Balfour went even further and said that designing and making model aircraft was work of national importance, while Lord Winster also acknowledged the value of the pursuit to Britain's future in aviation.

Inappreciation

FILM fans (writes an English correspondent in New York) will be sorry to hear that "The Way to the Stars" is not a great success in New York. Satiation with war films may be part of the reason, but, as it has been renamed by the inept title of " Johnny in the Clouds," and as it has (if one's memory serves one right) been sufficiently cut in several places to spoil the continuity, its failure is not altogether surprising.

A newspaper criticism that will interest students of Anglo-American relations was that the American characters were overdrawn and the British ones understated! . . . "To see ourselves as others see us!"

New Chief for Alvis

AFTER approximately a decade with the de Havilland Aircraft Co., Ltd., which he joined early in 1936, Mr. John J. Parkes has now been appointed managing director of Alvis, Ltd., and starts his new duties in the New Year.

Mr. Parkes, whose experience in the motor industry and aviation began in 1921, learnt to fly in 1926 and was one of the original members of No. 601 (City of London) Squadron, A.A.F. Later he took the instructors' course at the R.A.F. Central Flying School.

In 1929 he joined Airwork, Ltd., as technical manager and test pilot, was largely responsible for the formation of Heston Airport, and played a leading part in the development of export business and the establishment of air services in the Near and Middle East.

Mr. Parkes controlled 15 factories employing some 15,000 persons during the war, and says that in spite of jet propulsion he believes that the airscrew has " a good way to go yet " in conjunction with gas turbines.

Modellers' Wind Tunnel

MEMBERS of the Association of British Aeromodellers are to have a wind tunnel in which to carry out tests of components up to 2ft. in diameter.

This was decided by the Council of the Association on the recommendation of their Research Committee, and a sum of money considered adequate for its construction was voted for the purpose at a recent meeting.

The tunnel, when ready, is to be installed at the Association's headquarters at 28, Hanover Street, London, W.1, and members will be able either to make their own tests of wing sections and so on, or to send them for test and report by officials of the organisation.

Operation "Muskox"

FEBRUARY 14th is the date fixed for the "Muskox" expedition (previously mentioned in these columns) to leave Churchill, on the Hudson Bay, for its trip through Canada's frozen north to try out new methods of navigation and surveying in an area where compasses are useless.

It will be a joint undertaking by the R.C.A.F. and the R.A.F., and the expedition, which intends to penetrate to within 200 miles of the Magnetic Pole, will check the findings of the R.A.F. research party which carried out the polar flights in the Lancaster *Aries* last spring.

Technical observers from Britain and the U.S. will accompany the party.

Exploratory Trip

AIR VICE-MARSHAL ARTHUR L. FIDDAMENT, Senior Air Staff Officer of R.A.F. Transport Command, who last week arrived at Blackbush (Surrey) after a 36-day world flight of 34,000 miles in a Lancastrian, expressed the opinion that a pressurised cabin is essential on a long journey.

He described the flight as "an exploratory trip" to study Transport Command problems in various parts of the

HERE AND THERE

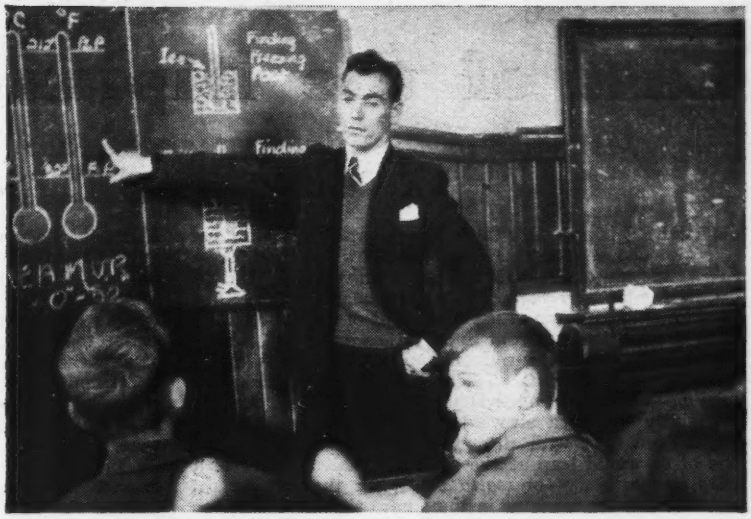
world, with special reference to air trooping. No special arrangements were made for spares or servicing, and the route was via Cairo, India, Ceylon, Chungking, Leyte, Australia, San Francisco, and Canada, the longest hop being the 2,400 miles from San Francisco to Montreal.

The Lancastrian was captained by Flt.-Lt. H. F. Payne, who headed a crew of 12; also carried were three members of the S.A.S.O.'s staff, including a W.A.A.F. section officer.

Hawker Changes

AS we go to press the following important changes in the board of Hawker Aircraft are announced: Group Capt. P. W. S. Bulman and Mr. H. Chandler have relinquished their seats on the board; Messrs. T. D. M. Robertson and A. N. Spriggs have been appointed to the Board; and Mr. P. G. Lucas, a director and chief test pilot, has been appointed general manager.

Group Capt. Bulman ("George" to everyone in British aviation) has been with the firm for twenty years, and his resignation will cause some surprise.



THE ROAD BACK: No. 1 Resettlement Centre, Scarborough, is the first of three such R.A.F. centres set up to help ex-P.o.W. in their return to civilian life. Here is a warrant officer, who wants to take up teaching, being given preliminary experience by arrangement with a local school.

News in Brief

THE Norwegian Air Training Camp at Winkleigh, Devon, has been closed with the return home of the last of 600 Norwegian personnel under training there.

* * *

No. 168 Transport Squadron, R.C.A.F., has completed 500 Atlantic crossings and flown 2,500,000 miles in the past two years.

* * *

Lord Woolton, chairman of the panel of selectors for the "Britain Can Make It" exhibition which is due to open early next July under the auspices of the Council of Industrial Design, has issued an appeal to manufacturers in the aircraft industry to start planning their entries immediately, and to have them ready by May 1st. The Board of Trade will, it is stated, sponsor the release from the Forces of skilled industrial designers needed by their firms for this purpose.

* * *

Mr. E. S. Little, a director and comptroller of the British Thomson-Houston Co., Ltd., has now been additionally appointed secretary to the company.

* * *

Dr. H. R. Hulme has been appointed Scientific Advisor to the Air Ministry at the age of 37, and will be responsible for planning operational, administrative and training research for the R.A.F. He was previously chief assistant at the Royal Observatory and, before that, director of naval operational research at the Admiralty.

* * *

Pursuing its policy of opening branch offices overseas, the S.B.A.C. has appointed Col. E. P. J. Ryan to be its regional representative for the Middle East and Greece, with his office in Cairo. He is the Society's second trade ambassador to be appointed (the first was Mr. W. T. W. Ballantyne who, as reported in *Flight* at the time, was appointed for Latin America and is already in Rio de Janeiro) and others are forthcoming.

* * *

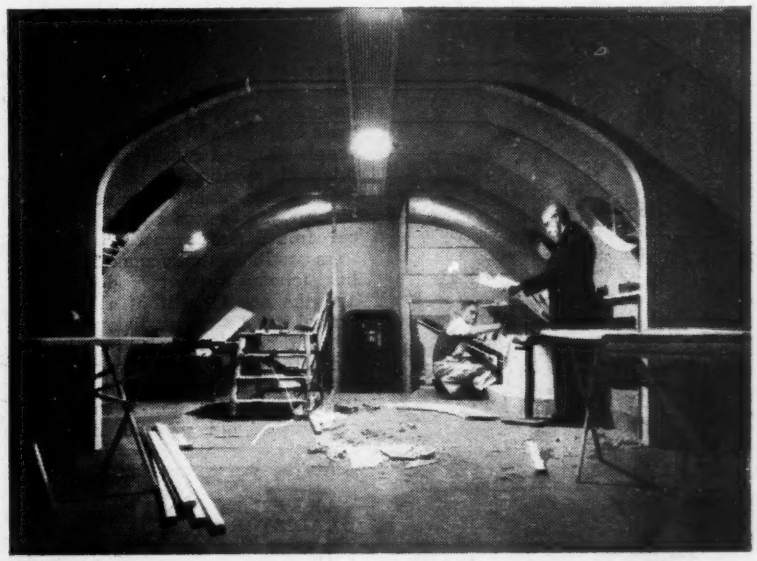
Wing Cdr. C. H. B. Price has now resumed his duties as publicity manager of Tecalemit, Ltd., Brentford, after 6½ years' absence from the company. During the latter part of his service with the R.A.F. he has been Chief Tactical Liaison Officer to the Psychological Warfare Division of S.H.A.E.F. and finally C.O. of the Berlin Information Control Unit.

* * *

Belfast and Birmingham branches of the R.Ae.S. have meetings fixed for January 15th and 16th respectively. The former is a lecture on "Stability and Control," by Mr. J. Graham, and the latter a discussion on "The Future of Air Transport," which will be opened by the president, Sir Frederick Handley Page, who is also president of the Institute of Transport. The Belfast meeting will be at the College of Technology, and the Birmingham one in the Chamber of Commerce, New Street. Both are timed for 7 p.m.

* * *

The Douglas XB-42 which set up a Long Beach to Washington record at over 430 m.p.h. recently, crashed a few days later near Oxen Hill, Maryland, and its crew of three, who baled out, attributed the crash to engine failure. This experimental bomber, which was commented upon in *Flight's* editorial of December 13th, employed contra-props in the extreme tail with shaft drive from engines within the fuselage.



THEY WON'T MIND IF THEY DO: In this mock-up of the main saloon of the Brabazon I (which is expected to fly in 1947), a foreman supervises work on that most popular item the cocktail bar.

IN THE AIR—VII

Last of the Biplane Fighters

Memories of the Gladiator and Gauntlet : Another of the Handling Series by "Indicator"

THERE is no doubt that the present-day pilot's ideas of the vague general impression which constitutes "seeing out" have undergone drastic modifications during the last few years. It is questionable whether one can, in fact, see more satisfactorily out of a Magister than from a Tiger Moth, or out of a Spitfire than, say, from a Gladiator. But the low-wing monoplane certainly gives one an impression of visual freedom which was as certainly missing—but never missed—in the days when one sat draughtily behind a strutted centre-section.

Yet even now, with all our low-wing conditioning, any one of us would leap at the chance of half an hour in a Gladiator or Fury—or (*sotto voce*), for that matter, in any other flying machine in these hard times. There was an irreplaceable something about those last biplane fighters —and this "something" is no nostalgic figment of later imaginings. When returning to the cockpits of such types after a year or two in the driving seats of more modern contraptions one felt, admittedly, almost as blind as the conventionalised bat, but this disadvantage was more than counterbalanced by a feeling of incipient mobility and a possibly false sense of confidence. This old box-kite, one thought, can, if necessary, be slipped and swish-tailed into any back-garden.

I remember that before the last of very few rides in Gladiators I quite deliberately chose to follow a direct if locally deviating course to my destination, even though it involved wandering down Welsh valleys with low cloud on all the ground above eight hundred feet or so.

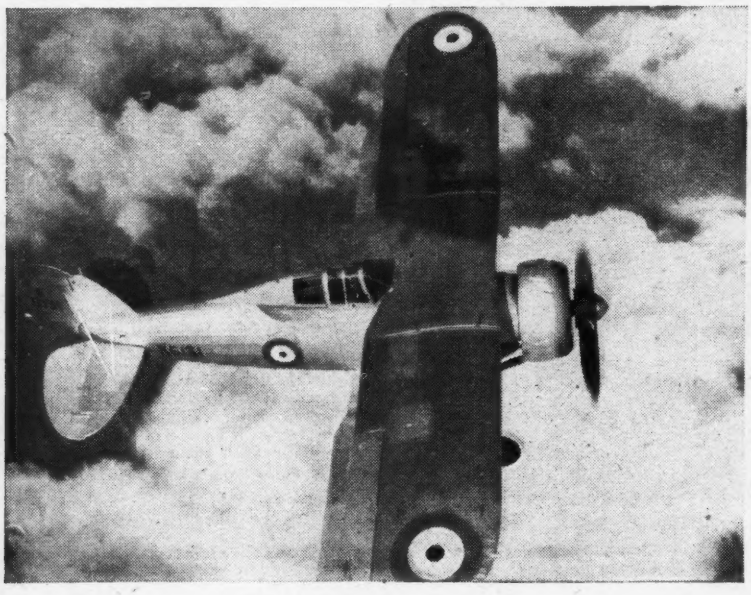
It was pleasant, drowsing behind a slow-revving Mercury, to slip along at a couple of hundred feet. Yet nothing would at that time have induced me to choose such a troublesome route while flying any of the more modern fighters. Later on one's ideas were different; Hurricanes and Spitfires were treated with an almost equivalent complete lack of respect. And perhaps even then the "new boys" would have had no such artificial confidence with an old-time fighter; perhaps it was the unconscious psychological outcome of an initial few years of flying in the cockpits of biplanes. But one seemed to know so well that the landing speed was comparatively low and that the approach, in the case of engine failure, could have been varied between almost indefinite limits by the simple expedient of holding varying degrees of coarse top rudder while judiciously eyeing the boundary of any chosen field.

Certainly, we could do things with the military aircraft of the 1936 era which we shall never be able to do with those built to the modern formula. Whether these things were worth doing is a matter of opinion, and I doubt if we should ever again be happy either with the layout or with the range of pilot's view which was offered.

Even the much-praised simplicity was largely illusory and was remembered with real pleasure only during the interim "drill-worried" period in which such items as retractable undercarriages and constant-speed airscrews needed to be consciously remembered by the pilot. In 1940, for instance, it was something of a rest-cure to take over any old-fashioned type, while, only three years later, a similar impression could just as well be obtained in the driver's seat of any early mark of Spitfire or Hurricane, while there was even something faintly worrying about an aircraft with *too* few taps and with a driving seat behind a sort of Eiffel Tower of struts.

Modern Beginnings

The Gladiator, in fact, showed just the faintest beginnings of modern "complications." Certainly in its later form it was fitted with drag flaps which had to be pumped down by hand but which, while not upsetting the aircraft's characteristics in the least, helped one to make an accurate engine-off arrival without the need for too much spectacular swish-tailing. It also had a sliding lid which tended further to increase one's sense of blindness, but which made the Gladiator quite warm and comfortable if, at times, somewhat smelly. This hood was operated by handle and did not involve one in the muscle-pulling gymnastics often necessary during the opening and closing operations with so many more advanced types. Aptly enough in the last fighter to be so fitted the fixed undercarriage was clean in the ultimate extreme and consisted only of a couple of faired cantilever struts with internally sprung wheels.



CAREFREE GLADIATOR: The words "top rudder" had a definite angular meaning in those days.

Of course, unlike so many modern aircraft, it was necessary to land these old front-liners properly. Wheelers were possible on very smooth surfaces, but nobody thought of doing them, and the usual result of a misjudged arrival was a most prodigious lift-cum-rebound bounce followed by a burst of motor and a carefully staged second attempt. But in those days we had all learnt to land an aircraft as it should be landed, and were in fairly good practice.

At the worst, one felt the wheels touch—or realised that they were about to touch—and went through a rapid reflex fore-and-aft motion on the column—thus

preventing the incipient bounce and placing the aircraft in the correct position for a second attempt. Even with the little flaps on the Gladiator there was plenty of reserve inertia to overcome any drag, and motor was only needed as a safety measure or if the premature touch-down had rocketted the outfit well up. And the pleasure of making a true thistledown three-pointer was nothing if not immense—and that pleasure has now, very largely, been taken from us.

Calm and Quiet

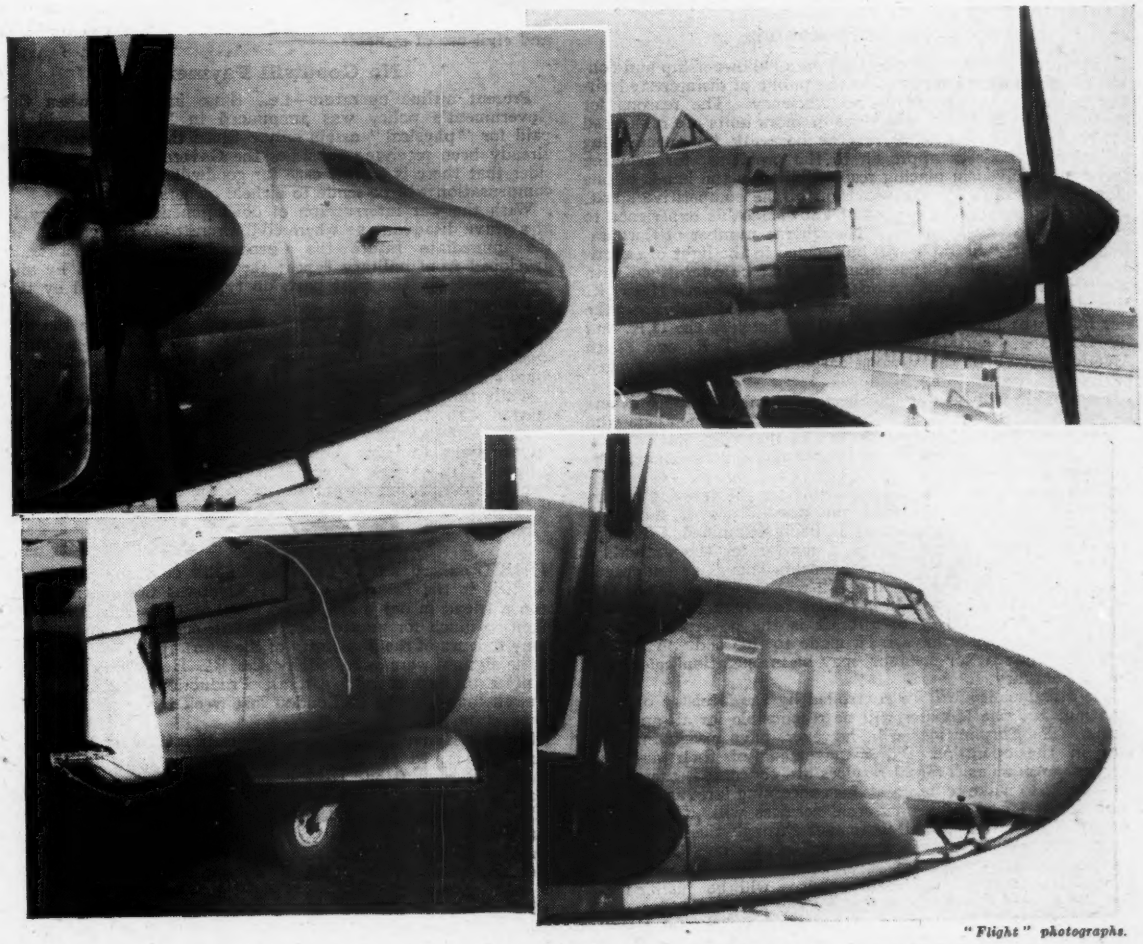
The starting procedure for the Gladiator's immediate predecessor, the Gauntlet, was far from simple. I still retain a faint memory of taps which had to be turned on and off, of petrol which spewed out at the psychological moment, and of the trick of "catching" the motor as it fired. My last Gauntlet, too, had had its Aldis sight removed, and I flew for an hour or so with a jet of cold air directed at my face from the resultant hole in the screen. Yet even that physical discomfort was amply balanced by the mental comforts provided.

But one of the greatest pleasures of the mid-modern military aircraft was the calm and quiet way in which it proceeded on its journeys, and the casually easy manner of its unsticking with the revolutions still well down.

Constant-speed airscrews may be all very well, and it is nice for the technicians to know that their engines are always revolving at the best speeds for different power conditions—but those speeds are, for the most part, uncomfortable and fussy. Probably a Mercury *should* revolve at 2,400 r.p.m. for efficiency and long life, but it was very much more pleasant to sit behind it when the revolutions were a mere 2,000 r.p.m. or less. One could almost see the airscrew blades crossing one's line of vision to the faint familiar "clicking" sound from the valve and reduction gears.

In spite of pleasant memories of quiet, effortless passage in the fighters of a previous decade, I will refrain from saying "those were the days." They well may have been, but later days also had their compensations as one rumbled effortlessly along at something over three hundred—not the least of which was the knowledge that an engine failure, followed by a foozled forced-landing, left one with a smooth-keeled and very strong fuselage which seemed to be able to plough through most things without suffering serious disintegration. Our simple old friends usually went over very smartly if they hit the hedge in an accidental overshoot, and the centre-section was not always strong enough to save one's valuable neck and streamlined wires could be a menace.

THREE NOSES AND A TAIL



"Flight" photographs.

(Top left) The sleek and civil nose of the Avro Tudor with a glimpse of one of the circular-cowled Merlins. (Top right) In Fairey Spearfish the Bristol Centaurus is exceptionally closely cowled. The recessed exhaust stubs complete the perfect streamlining. (Bottom left) The "sting" arrester gear hook and retractable tail wheel of the Spearfish. (Bottom right) The military nose of the Vickers Windsor is sharklike. Sitting with his head in a streamlined blister the pilot is able to see all round.

Preparing for Nationalisation

The Civil Aviation White Paper : Original Policy Unchanged

WHEN the broad outline of the civil aviation nationalisation scheme was given by Lord Winster in November there was reason to hope that the resultant White Paper, would, when it appeared, be more explicit. In particular, it had been suggested that this White Paper would not be issued until the Government had conferred with the various transport interests. Such, apparently, has not been the case, and until the debate, which is due for January 24th, and the introduction of the Bill, which should be appearing in February, the scheme is described in general terms. At a Press conference on December 19th, Mr. Ivor Thomas enlarged on the Paper.

The basis of the plan is that it has been framed in such a way that it can, in due course, be readily fitted into any future international organisation, and it will be the policy of the Government to endeavour to negotiate agreements with other countries with the ultimate objective of securing well-ordered development on an international basis. By agreement, services on Empire routes will be operated in parallel under partnership arrangements which will provide for the pooling of traffic receipts, the avoidance of duplication, and the common use of facilities. If and when Dominion Governments wish, these arrangements will lend themselves readily to transformation into a Commonwealth Corporation and the Government are ready to make similar arrangements with other countries.

Three Corporations

The Government considered that national ownership and control offers the best guarantee to the public of disinterested airline expansion in economy and efficiency. The reasons for splitting the operations into three or more units are influenced by the need for flexibility, of the necessity for encouraging different methods of approach to the problems, for avoiding the risks involved in placing responsibility in the hands of one managerial group, for the provision of the competitive spirit, and for the creation of a pool of knowledgeable experience to meet anticipated expansion. Though the number of Corporations ultimately desirable will be decided in the light of experience, three separate Corporations will first be established with the following spheres of action: (a) routes between the U.K. and other Commonwealth countries, the United States and the Far East; (b) internal routes and those between the U.K. and the Continent; and (c) routes between the U.K. and South America. Each of the various corporations will be managed by its own board.

The boards will include members who can contribute expert knowledge, and provision will also be made for members who have experience of surface transport so that co-operation with other services in the matter of time-tables and booking facilities can be arranged.

The Corporations will be responsible for the training of aircrews and ground staffs, and the possibilities of combined arrangements for such training is being examined. Though day-to-day maintenance will be a matter for the individual Corporations, centralised arrangements may be adopted.

Although it is hoped that the Bill will be passed during the coming session, there will be no delay in starting the services and, though the supply of aircraft is the governing factor, interim arrangements have been made to this end. A service to South America, for instance, may be in operation before the end of February.

The broad policy will be controlled by the Ministry of Civil Aviation, and the Minister will be responsible for all appointments. The Corporations will, however, have maximum freedom in the operation and management of their assigned services. As far as internal services are concerned, the public will be able to make representations concerning fares and service frequency. The fares for external services will, it is hoped, be settled by international agreement through the I.A.T.A.

Air transport should be made self-supporting as soon as possible and elimination of subsidies by international agreement will be sought. Certain services will be justified on "public service" grounds even when run at a loss.

Although the exchequer will bear all deficits, and will, theoretically, take any profits, these will generally be "ploughed back" into a Corporation. Assistance during the initial period will take the form of "deficiency grants" with, for a start, detailed control over estimates and expenditure. Afterwards, financial assistance will be based on the system of agreed estimates which will be subject to annual review. In order to give an incentive to economy any saving on the estimates may be retained by the Corporation concerned.

Since only the community can bear the heavy expenses of modern airfields and because "order" must be maintained, the State will take over all airfields to be used by air transport. Mr. Thomas explained that, in any case, it would be impossible to work out the present value of many privately owned airfields which had been extended and improved at State expense during the war years.

International airfield standards and procedure are at present the subject of investigation by the Provisional International Civil Aviation Organisation, and the Government will co-operate in such matters to the fullest extent. As an adherent of the Interim and International Air Services Transit Agreements concluded at Chicago, the Government has accepted an obligation to provide the airfields and facilities necessary for international air services, and certain particular airfields are equipped to agreed standards. For oceanic services the "designated" airfields are Hurn (until Heathrow is ready), Prestwick, and possibly one other. Until Heathrow is used Croydon and Northolt will be the airfields for London, with emergency alternatives selected from among suitable Service airfields. Mr. Thomas said that two runways at Heathrow would be ready for use before the end of February. In certain cases, in order to reduce wastage, there will be joint military and civil use of airfields.

No Goodwill Payment

Present airline operators—i.e., those in action when the Government's policy was announced in November—will be paid for "physical" assets only. Since these operators have already been receiving subsidies the Government do not consider that there is a clear case for goodwill payment. Similar compensation will be made to airfield owners.

With the war interruption of development, this country is at a grave disadvantage where civil aircraft are concerned. In the immediate future the Corporations will use aircraft developed from military types; these will be followed by aircraft based, for the most part, on types recommended by the Brabazon committee.

The Government lays the greatest possible stress on the importance of research and development. No new civil aviation research department is proposed, but civil aviation will have equal status with other claimants.

While the Corporations will be impowered to proceed with charter work, this will also be open to private operators. The definition of "charter flying" may be qualified in due course. Private and club flying gliding will be encouraged.

Finally, the White Paper explains that it is the Government's aim to bring air travel within the reach of all sections of the community.

LOCKHEED GO HOME

THE Lockheed war organisation in this country—its official title is the Lockheed Aircraft Overseas Corporation—has been a friend in our midst for so long, and has therefore been taken so much for granted, that it will come as a surprise to many to learn of the immensity of the effort at Speke.

The figures were revealed by the Rt. Hon. John Wilmot, Minister of Supply and Aircraft Production, speaking at a farewell dinner given in London last week to members of the Corporation.

The first Hudson—actually the first aircraft to reach us from overseas—arrived at Liverpool on February 15th, 1939. By 1941, 1,000 aircraft had been assembled and passed into operational service. In that year a second factory was opened at Sydenham, near Belfast (though shipping considerations later compelled its abandonment) and a Scottish factory was established at Abbotsinch, later moving to Renfrew. In all, nearly 6,000 aircraft were assembled in the two Scottish plants under the management of Mr. Dan Stevenson.

But it was at Speke that the main job was done by Mr. Hank Ogden's workers under the supervision of Mr. Dan Gribbon and Mr. Harry Walker. At the end of 1940, a nucleus of Americans had trained 200 local employees. By the end of 1944 the total of workpeople was 2,275.

In all, 19,626 aircraft passed through the Lockheed factories in Britain during the fateful seven years.

Operation "Deadlight"

Coastal Command Attack Surrendered U-Boats

Illustrated by Flight Photographs

THE stock of U-boats acquired with the defeat of Germany is being steadily diminished in various ways. The Navy have despatched some with gunfire, and on Sunday, December 16th, R.A.F. Coastal Command Mosquitoes, Warwicks and Liberators from 19 Group were given two to destroy out in the Atlantic off the coast of Northern Ireland—one for the Mossies and the other for the "heavies," the operation to be called "Deadlight."

At the briefing, we were told that the subs would be found at 55.50 N. by 10.05 W. with an aircraft carrier, H.M.S. *Nairana*, acting as the control ship. The target area is about 130 miles W.N.W. of Inishtrahull Island, off Malin Head, the northernmost point of the Irish mainland, and is outside 100-fathom soundings.

The Mosquitoes, in two flights of six each on detachment from 248 Squadron, were to go in first and be clear of the target area at 11.00 hrs., so that the Warwicks and Liberators respectively, detachments from 179 and 224 Squadrons, could be on the job at 11.30 hrs.

We were flying in Liberator H-Harry (Flt. Lt. J. Poulter), whose job it was to lay out, by means of sea-markers, a 36-mile, four-leg attack circuit for the heavies, so that each successive Warwick and Liberator would go off round the left-hand circuit, ending with a run-up to the target. Whilst the attacks were being made, we were to drive round a small right-hand circuit.

Unpleasant Conditions

A thoroughly beastly sea appeared to be making the naval end of the operation rather unpleasant and, as the subs could not very well be anchored in well over 100 fathoms, they had drifted quite a good way from the arranged target area. However, this did not make much difference to the aircraft, although the generally poor visibility and foam-flecked sea made it quite easy to lose sight of the U-boats whilst going round our circuit, and in order to reorient ourselves we had to try to keep tabs on the control ship and on her escort destroyers, H.M.S. *Cosby* and *Blencathra*. This was by no means so simple as it would seem; a general cloud base of about 1,200ft. with squalls and decaying cloud down to the surface complicated a condition already aggravated by the fact that the carrier and escorts had to keep steaming gently to maintain steerage way, negative the effect of the 40-knot wind, and still keep more or less in company with the U-boats.

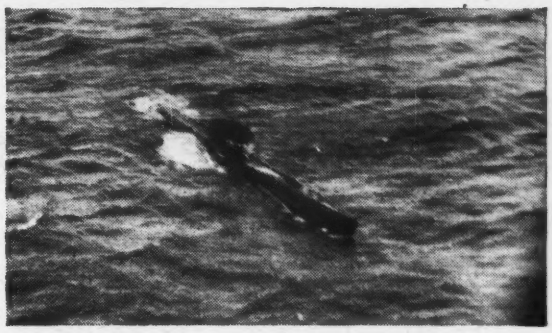
Both flights of the Mosquitoes came in and all made good attacks, every aircraft recording a target strike with its 25 lb. rockets. Their U-boat got severely hammered and slowly settled lower and lower in the foam-laced water, to sink from sight beneath the heavy swell about three minutes after the initial strike. The circling Mosquitoes re-formed into their respective flights and we lost sight of them as they made off eastwards into the murk.

Air Vice-Marshal C. B. S. Spackman, C.B.E., D.F.C., Air Officer Commanding R.A.F. Northern Ireland, was watching the operation from an independent Mosquito not included in either of the attacking flights, but before the first Warwick was due to make the initial attack on the second sub, the control ship was asked permission for the A/O.C.'s aircraft to make an attack; this was given, and the Mosquito made a nice run-in, scoring strikes on the base of the conning-tower.

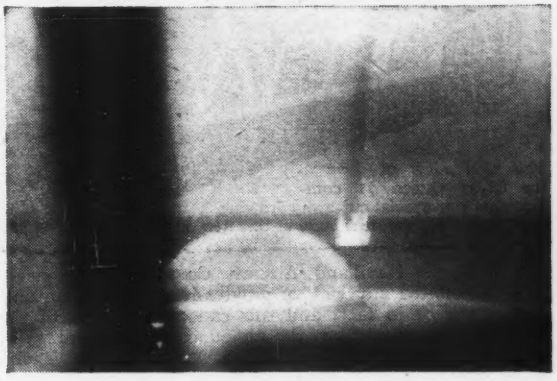
Now it was the turn of the Warwicks and Libs. with their six 250 lb. depth charges apiece. Unfortunately, the first Warwick's D.C.s stuck-up and he had no chance for another try, because the Liberator following him made a perfect "kill."

This aircraft, V-Victor, captained by F/O. E. Light, went in at 500ft., seemingly as steady as a rock; the stick of depth charges was dropped just ahead of the sub's bows and, almost immediately, the boat was hidden by a smothering mountain of foam which, quickly caught by the gusting blast of the wind, was pulled aside like a drifting, gauzy curtain beneath which the bows of the submarine slowly lifted and disappeared in a welter of boiling overfalls. It was a copybook example of the perfect kill: the U-boat was out of sight on its way down to the bottom of the Atlantic in little more than ten seconds.

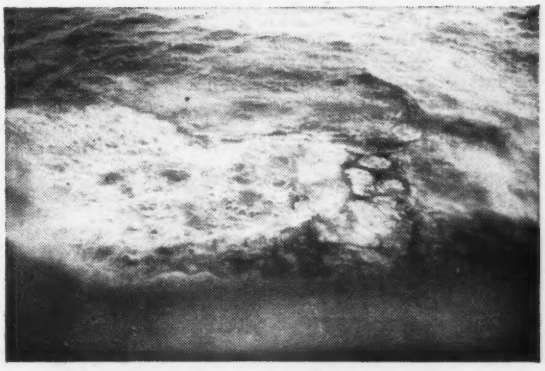
We circled round, looking out at the desolation of water, then headed eastward through the filthy weather toward the comfort of land.



Episode 1 — the target of Liberator V-Victor



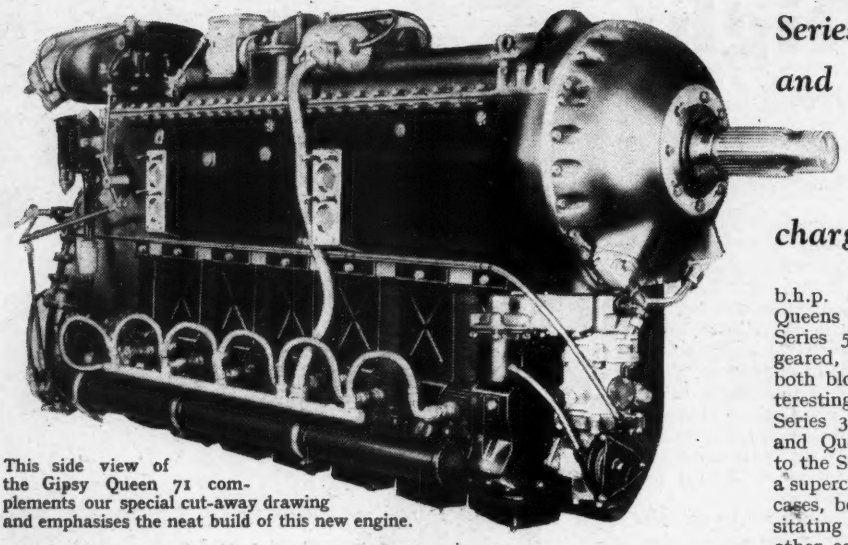
Episode 2 — the kill.



Episode 3 — A slick marks the spot.

New Gipsy Engines

Series of Units in Major and Queen Ranges : Increased Power Output : Supercharged and Geared



This side view of the Gipsy Queen 71 complements our special cut-away drawing and emphasises the neat build of this new engine.

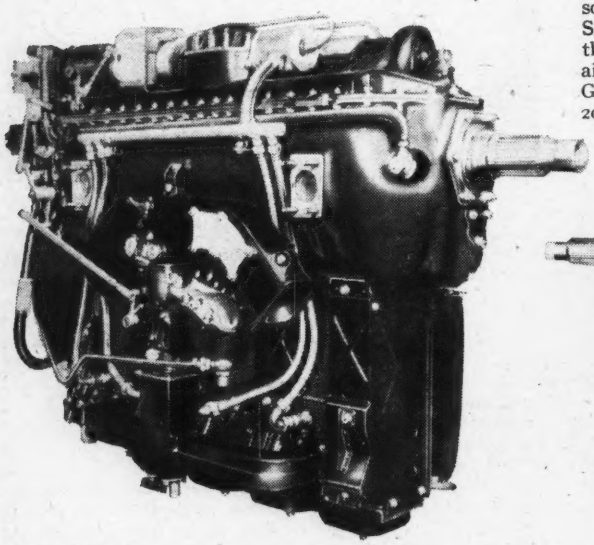
THE de Havilland Aircraft Company have never exhibited any lack of progressiveness either in outlook or in fact, and this can also be said of the Engine Company. Thus the announcement of a range of five new engines will come as no surprise to those who have learned what to expect from de Havillands.

Power outputs to suit almost every type of light to medium-weight civil aircraft (or comparable Service machines, for that matter) are made available by the new range of engines, the powers of which run progressively from 160 h.p. to 330 h.p. In the Gipsy Major range the Series 30 and Series 50 give maximum power outputs of 160 b.h.p. and 200 b.h.p. respectively, the higher-powered Series 50 engine being supercharged.

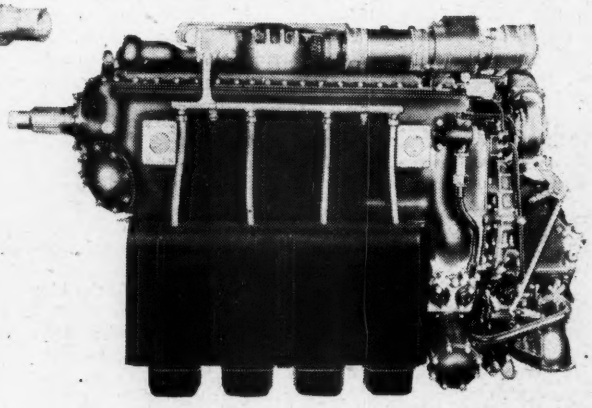
Gipsy Queens are made in Series 30, 50, and 70, their respective maximum power outputs being 250 b.h.p., 300 b.h.p. and 330 b.h.p. Series 30 Queens are unblown and ungeared; Series 50 are supercharged but ungeared, whilst Series 70 engines are both blown and geared. It is an interesting point of design that the Series 30 engines in both the Major and Queen ranges can be converted to the Series 50 types by the fitting of a supercharger, this alteration, in both cases, being applicable without necessitating any substantial change of other components.

Change-over from a wartime to a peacetime programme necessitates a great deal of reorganisation and, for this reason, de Havillands are concentrating initially on production of the new six-cylinder Gipsy Queen range of engines. These will be available during the coming year and the four-cylinder Gipsy Major 30 and 50 Series will follow as soon as factory capacity allows.

To bridge the gap until such time as the new Major Series are in production, improved models of two current engines are being made and are available to aircraft manufacturers immediately. One is a lighter and refined version of the engine used to power the evergreen Tiger Moth, the power having been stepped-up from 130 to 145 b.h.p.; this unit is called the Gipsy Major 10, and will have a modified back cover incorporating flanges to take, in addition to normal equipment, a 12-volt generator, Plessey vacuum pump, and Plessey hydraulic pump or Heywood compressor. The second engine is the equally well-known Gipsy Six II, to which refinements have been introduced in the course of its lengthy service in Proctor and other aircraft—this engine is almost universally known as the Gipsy Queen II, and remains in production to serve the 200 h.p. class.



GIPSY MAJOR 31 : The smallest engine of the new Gipsy range, the Major 31 is probably as fine an example of an aircraft engine in the 150 h.p. class as one could find.



GIPSY MAJOR 51 : Neatness and compactness characterise the new supercharged four-cylinder Major 51, with 197 h.p. available for take-off.

from 1942 to 1945
two-thirds of all the bombs
dropped by Bomber Command
were dropped by

AVRO LANCASTERS

SUPERPLANES BY AVRO

A. V. ROE & CO. LTD., MANCHESTER. *(Branch of Hawker Siddeley Aircraft Co. Ltd.)*

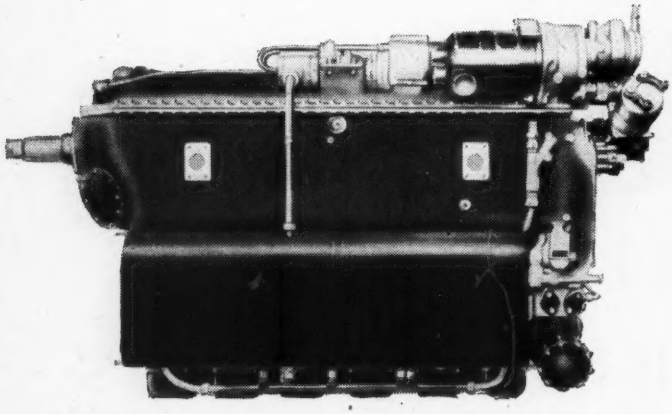
E

In view of the design similarity in each of the Major and Queen types, it is desirable, for descriptive purposes, to concentrate on the most highly developed engine in each range, and at the same time give the data relevant to the other engines in the series. For the same reason, this review deals mainly with the Gipsy Queen 71 engine, as the first of the new Series 70, while the Gipsy Major Series 50 engines will be dealt with in *Flight* at a later date.

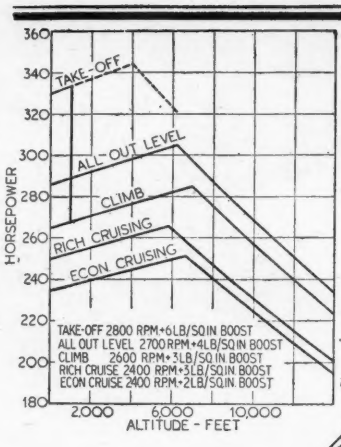
The Queen 71 is a six-cylinder, inverted, air-cooled engine which is supercharged, and geared for use with a constant-speed feathering and braking airscrew. There are, however, particularly interesting detail points of design which are eminently worthy of study, conventional though the engine may be in its general concept. Our perspective cut-away drawing will make clear to the reader the general form of the engine and also illustrate the various detail arrangememnts which make this particular unit so interesting.

The Crankcase

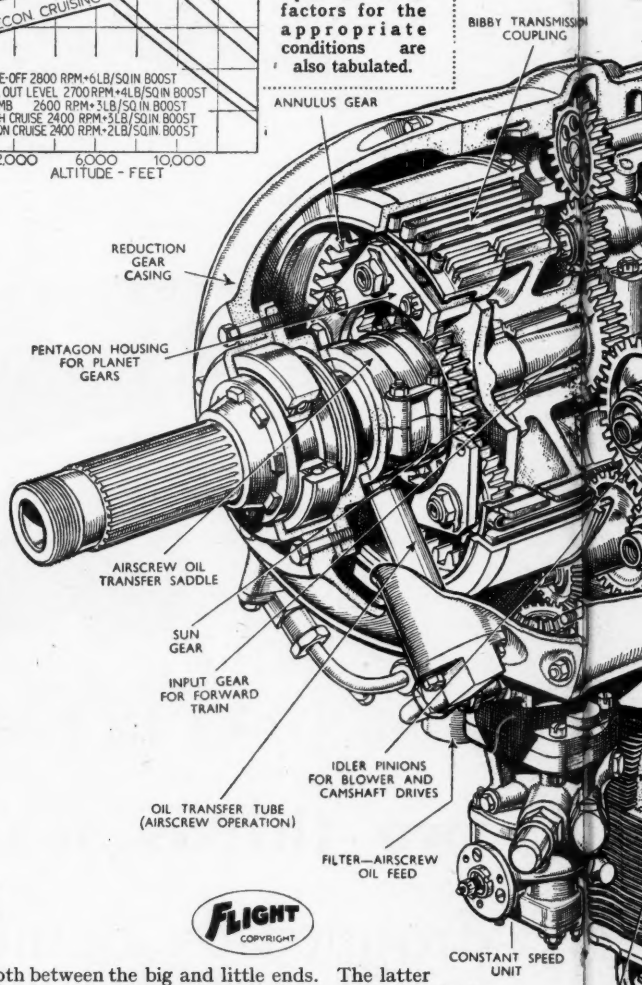
It would, perhaps, be best to start with the crankcase, which forms the body on which all other parts are fitted. This unit is an aluminium alloy casting of clean design, and the transverse webs which support the main bearings have limberholes for free passage of oil to the scavenge pumps. Nominally, the main bearing caps are secured with four studs each, two per side, but the front (No. 1) and central (No. 4) bearings have caps which are, additionally, side-located against faces machined in the bearing webs, and are further strengthened by a transverse bolt spanning the crankcase through webs and caps. Main and big-end bearings are of the strip type; that is, a bearing surface formed of a bronze lining bonded to a steel backing, the bronze lining being coated with lead on which is deposited a flash of indium.



GIPSY QUEEN 31 : Smallest of the new six-cylinder range, the Queen 31 is unsupercharged and ungeared, but gives 250 h.p. at sea level and cruises at 180 h.p. for 12 gall./hr.



These performance curves for the Gipsy Queen 71 illustrate the power range available for given altitudes in the several operating conditions, and the r.p.m. and boost factors for the appropriate conditions are also tabulated.



The crankshaft is a steel stamping machined all over and is, of course, fully balanced. Big-end and main bearing journals are hollow, the ends of the bores being closed with sealing caps retained by a single axial bolt. Oil holes for bearing lubrication are drilled radially through to the journal interior at positions normal to the plane of the crank throw, thus centrifugal force keeps sludge away from the oil duct to the bearing surface. Each crank throw is fitted with a pair of pendulous-type dynamic dampers to preclude untoward torsional vibration. These dampers each consist of two circular steel discs with oversize bores through which are fitted a pin, itself housed in an oversize hole through the crank web. By this means rotational movement between discs, pin and crank-throw is of necessity a rolling motion, the median position normally being held by centrifugal force. Any torsional vibration in the crankshaft, however, causes relative displacement of the absorber masses, so tending to neutralise the vibratory motion of the crankshaft.

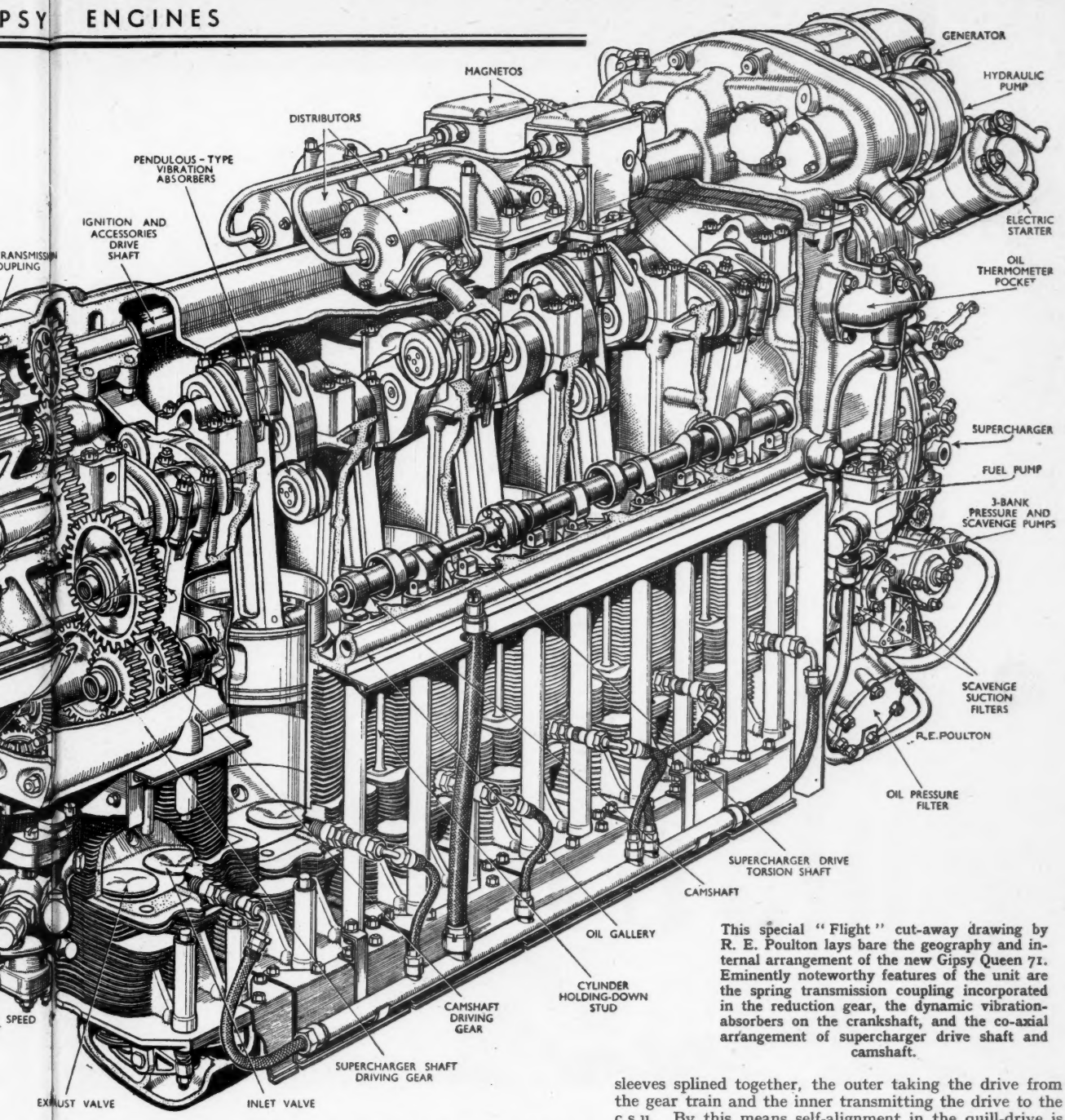
Connecting rods are of I-section steel, parallel in width and depth between the big and little ends. The latter are bronze-bushed for the hollow steel gudgeon pins, which are retained in the pistons by circlips. Pistons are short skirted with flat crowns; two gas rings and one scraper are fitted.

Both the front and rear end of the crankcase have their complement of gears, the front trains driving the camshaft, supercharger, constant-speed unit and ignition system, whilst the rear trains are for supercharger speed increment and also for accessories drive.

The supercharger and camshaft drives are particularly interesting and offer a good example of design ingenuity. On the front end of the crankshaft forward of No. 1 main bearing is mounted the driving wheel for the forward gear train which drives both the camshaft and the supercharger drive shaft, the latter being housed coaxially within the former. As the two run at different speeds, the arrangement of the driving gears is somewhat involved at first sight, although actually it is straightforward enough.

In order to provide a bearing for the blower drive shaft, the camshaft is made in two parts which are bolted to-

PSY ENGINES



This special "Flight" cut-away drawing by R. E. Poulton lays bare the geography and internal arrangement of the new Gipsy Queen 71. Eminently noteworthy features of the unit are the spring transmission coupling incorporated in the reduction gear, the dynamic vibration-absorbers on the crankshaft, and the co-axial arrangement of supercharger drive shaft and camshaft.

gether through flanges midway along the shaft. Into the mating ends of the camshaft, at the central joint, is pressed a bronze bush which serves as a bearing for the land on the blower drive shaft, this being specifically designed as a "torsion-bar" drive so that some measure of flexibility is introduced to divorce inertia of the impeller and its gear drive from the crankshaft system.

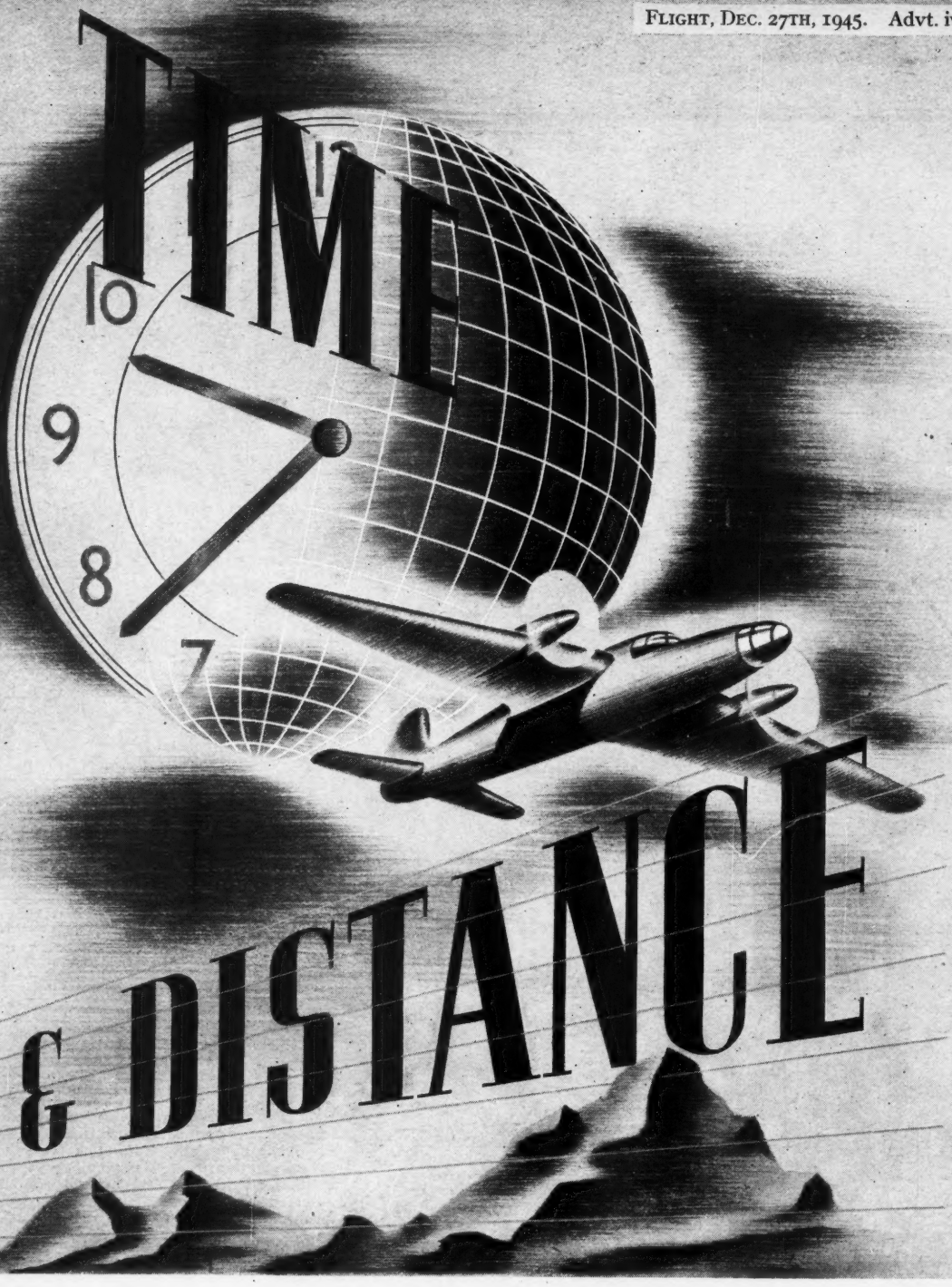
C.S.U. Drive

Plain bronze bushes are pressed into the main bearing webs of the crankcase to accommodate the two-inch-diameter journals of the camshaft bearings. Exhaust and inlet cams are harmonic and of a fairly quick lift profile.

Before going on to describe the ignition system drive, the constant speed unit transmission is well worthy of note. This, in effect, is a double, co-axial quill formed by two sleeves splined together, the outer taking the drive from the gear train and the inner transmitting the drive to the C.S.U. By this means self-alignment in the quill-drive is obtained.

An idler wheel is carried off the cap of No. 1 main crankshaft bearing and is driven by the input wheel on the end of the shaft, meshing, in turn, with a pinion internally splined to the end of a drive shaft carried centrally along inside the crankcase top cover. This is the drive for magnetos and distributors; however, as the mags. run at 1½ times engine speed and the distributors at half engine speed a further gear train is required, this time a duplex type to accept the drive centrally and transmit it on either hand to the magnetos and distributors mounted externally fore and aft on each side of the top cover. Simms coupling are fitted in the magneto drives, and each magneto incorporates an impulse starter to produce a healthy spark to facilitate starting.

The ignition components are situated about half-way



More miles per hour at less gallons per mile, with maximum comfort and safety . . . Rotol Lightweight Propellers, with their aerodynamic "Adaptability," have been proved to contribute considerably towards this dual desideratum of to-day's private planes.

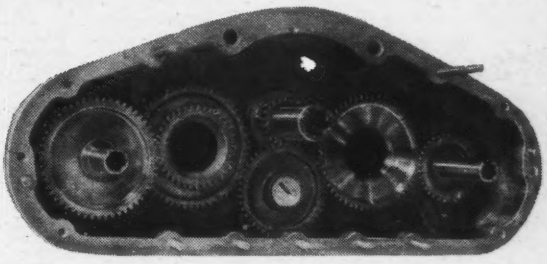
ROTOL 'CONSTANT SPEED'
Lightweight VARIABLE PITCH PROPELLERS

ROTOL LIMITED • GLOUCESTER

NEW GIPSY ENGINES

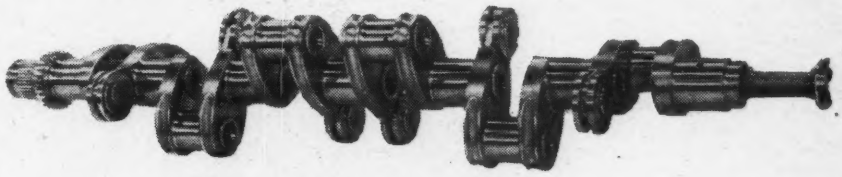
along the crankcase, and an extension of their driving shaft runs to the rear of the engine for the accessories drive. Thus, in effect, a two-part drive shaft extends the full length of the crankcase inside the top cover, and at the point at which the two parts meet in the centre (where the magneto/distributor drive is taken) each is splined to a coupling sleeve, and inside this sleeve, between the ends of the shafts, a coil compression spring is interposed to preload the shafts endwise and eliminate end float.

At the rear end of the engine, the top cover is enlarged locally to house the accessories driving gear train. The input gear of this train is splined to the end of the drive shaft just described and meshes with idler wheels on either hand; these, in their turn, drive outer pinions, each of which carries a quill to drive respectively (to port) a Lockheed Mk5 or Mk6 hydraulic pump or a Heywood SH6/2 compressor, and (to starboard) a Pesco B3X vacuum pump. Above the input gear and meshing with it is a further idler mounted on an externally splined shaft which engages the quill to drive the generator.



Train of driving gears at rear of top cover for accessories drive.

The after end of the camshaft protrudes into the rear wheelcase and carries an integral spur pinion and bevel; the former of these drives the tachometer shaft whilst the bevel powers the shaft driving the fuel and oil pumps. The fuel pump is an eccentric vane type but the oil pumps are embodied in a single three-bank unit. All three banks are gear type, the first being positive pressure and the other two scavenge; both of these latter serve the crankcase, one at each end. Both scavenge pumps are of greater capacity than the pressure pump to allow the whole of the drainage oil to be dealt with in either climbing or diving attitude.



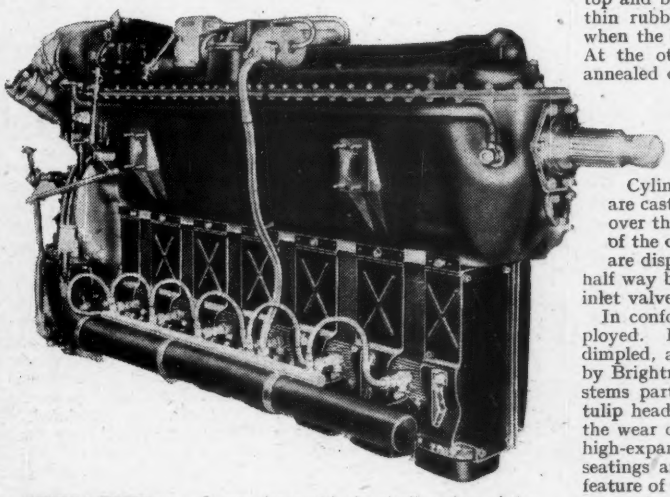
Detail of crankshaft, showing the dynamic vibration-absorber discs fitted to the counterweights.

From the rear end of the torsion shaft, housed within the camshaft, the supercharger drive is taken, the train between shaft and impeller spindle being a three-stage multiplying gear which drives the blower impeller at 11/22 times crankshaft speed. This impeller, incidentally, could almost be described as "a dear little thing," for it is only six inches in diameter.

Magnesium alloy is used for the supercharger casing which, of course, is cast. The rear half of the volute embodies a diffuser face for the impeller, and around the outer facet of this face are disposed the diffuser vanes, set in a ring screwed to the front half of the casing. Outside and behind the diffuser face is the volute collector duct terminating at the delivery port.

An interesting feature is that the intake duct to the impeller carries an external oil jacket served by one of the scavenge pumps so that the oil may give up some of its heat to warm the charge and preclude icing of the mixture. Oil from this jacket also warms the carburettor. A further unusual feature is that a thermometer is fitted into the intake duct to register the temperature of the inducted charge.

The electric starter motor for the engine is mounted on the top of the front casing of the blower and drives through a shaft dogged direct to the end of the crankshaft.



GIPSY QUEEN 51 : Comparison with the similar view of the Queen 71 will show that the chief difference between the two engines is the absence of a reduction gear in the Series 51.

Having dealt with most of the rotating parts of the engine, we will now have a look at some things that keep stationary—the cylinders and their heads. Cylinders are machined complete from forged billets, the fins being quadrantly recessed for the holding-down studs. Whilst referring to fins it may be noted that the number of fins to cylinders and heads has been increased by roughly 30 per cent. over the normal Gipsy Six standard. Each cylinder has an extended skirt which stands proud inside the crankcase by 1¾in., and so prevents excess oil getting to the inside of the pistons. Too much oil under piston heads is the greatest cause of carbon in the oil and, of course, leads to excessive consumption. Cylinders are sealed top and bottom, for around the outside of the skirt is fitted a thin rubber ring which is compressed against the crankcase when the cylinder is tightened down, so providing an oil seal. At the other end, fitting against an external recess, is an annealed copper ring to act as a gas seal, the head clamping down upon it—actually an individual ring gasket. The cylinder bores are ground finished, which seems, in practice, to provide a most efficient form of primary surface to ensure good wearing qualities.

Cylinder heads are castings, each having 28 fins which are cast finished. The combustion chamber has a flat crown over the valve ports, this being machined, but the remainder of the chamber is scurfed-finished—well finished, too. Plugs are disposed one each side but not symmetrically, one being half way between the valves and the other one-third across the inlet valve.

In conformity with Gipsy precedent vertical valves are employed. Exhaust valves are semi-tulip headed, i.e., slightly dimpled, are of austenitic steel, have head and seat protected by Brightray treatment, are stellited on the tip and have their stems partially filled with metallic sodium. Inlet valves are tulip headed, of stainless steel, and have stellited tips to take the wear of the rocker striking pads. Valve seats are N.M.C. high-expansion steel inserts, the exhaust valves having 45 deg. seatings and inlet valve 30 deg. seatings. A rather unusual feature of the valve springing is that the two concentric springs per valve are unequally coiled in pitch as an anti-surge measure, and, further, each spring is of right-hand helix, the idea being that the valves will rotate on their seatings and so

NEW GIPSY ENGINES

ensure even wear all round. It will be interesting to see how this arrangement works in practice—it is certainly unconventional.

Rockers and push-rods are straightforward, the latter being enclosed in light dural tubes between cylinder heads and tappet guides. Tappets themselves are steel and the guides duralumin. Lubrication of the rocker gear is furnished by oil which seeps down the push-rods inside the housing tubes.

We must now go back to the front end of the crankcase to deal with what is perhaps the most interesting single feature of the engine—the reduction gear.

An epicyclic gear has the dual advantage of permitting the input and output shafts to be coaxial and, at the same time, allows of their rotation in the same direction, thus giving a torque reaction on the reduction gear casing equivalent only to the *difference* between the respective shaft torques; therefore, it is, perhaps, natural that it should have been selected for the Queen 71 reduction gear. When input and output shafts rotate in opposite directions a wringing reaction is produced on the gear casing with a magnitude equal to the *sum* of the respective torques, and this, consequently, makes necessary a far more robust casing—obviously a less desirable arrangement.

Flexible Coupling

Epicyclic gears are themselves not particularly interesting, at least in basic principle; but what is almost revolutionary about the Gipsy Queen is that a flexible spring transmission coupling is incorporated.

The airscrew shaft is supported at the rear in pressed-in white-metal/steel bearings in the hollow front end of the crankshaft, and at the front in a large ball bearing housed within the reduction gear casing. The airscrew shaft itself carries the pentagonal plates between which are pivoted the five planet wheels at the pentagon apices. Also on the airscrew shaft (which acts as a journal) is the sun gear drum with which the planets mesh, and the sun gear is held stationary by being dogged to a retaining annulus bolted to the r.g. casing.

External splines on the end of the crankshaft engage with internal splines in the bore of the annular driving drum, which is in three all-steel parts, (i) the section taking the drive from the crankshaft, (ii) the outer "drum" casing which is bolted to (i) and encloses the spring coupling, and (iii) the annulus gear or orbital drive ring which meshes with the planet gears. Parts (i) and (iii) are toothed on their peripheral faces for the Bibby spring which couples them together. Reference to the illustrations will make clear the arrangement. In addition to absorbing torsional shock—which occurs three times in every crankshaft revolution—the coupling permits a degree of radial float in the orbital drive ring (iii) which ensures that the drive is equally distributed on all five planet gears.

PERFORMANCE DATA for the GIPSY ENGINE RANGE

	GIPSY MAJOR		GIPSY QUEEN		
	Series 30	Series 50	Series 30	Series 50	Series 70
Bore and stroke (mm.)	120×150	120×150	120×150	120×150	120×150
Compression ratio	6.5 : 1	6.5 : 1	6.5 : 1	6.5 : 1	6.5 : 1
Capacity (litres)	6.78	6.78	10.18	10.18	10.18
Rotation	L.H. tractor	L.H.	L.H.	L.H.	L.H.
S'charger gear ratio	—	11.16 : 1	—	11.16 : 1	0.711 rdctn. 11.22 : 1
Fuel	80 oct. with 4 c.c. (max.) T.E.L./gall.	87 oct. with 4 c.c. (max.) T.E.L./gall.	80 oct. with 4 c.c. (max.) T.E.L./gall.	87 oct. with 4 c.c. (max.) T.E.L./gall.	100 octane
Oil	DED. 2472B.	DED. 2472B.	DED 2472B.	DED. 2472B.	DED. 2472B.
Dry weight	340 lb. +2½%	410 lb. +2½%	510 lb. +2½%	560 lb. +2½%	660 lb. +2½%
PERFORMANCE (with C.S. Airscrew)					
International Rating :					
b.h.p.	156	175	245	260	285
r.p.m.	2,400	2,300	2,400	2,300	2,600
Altitude (ft.)	S.L.	6,000	S.L.	6,000	7,000
Max. Power Rating :					
b.h.p.	160	180	250	270	305
r.p.m.	2,500	2,400	2,500	2,400	2,700
Altitude (ft.)	S.L.	7,000	S.L.	7,000	6,000
Max. Take-off Power :					
b.h.p.	160	197	250	295	330
r.p.m.	2,500	2,500	2,500	2,500	2,800
Altitude (ft.)	S.L.	S.L.	S.L.	S.L.	S.L.
LIMITING CONDITIONS (with C.S. Airscrew)					
Take-off :					
r.p.m. —max.	2,500	2,500	2,500	2,500	—
—min.	2,000	2,300	2,000	2,300	2,800
Boost	Full Throttle	+5	Full Throttle	+5	+6
S.L. b.h.p. —max.	160	197	250	295	—
—min.	138	180	210	275	330
Max. Climb :					
r.p.m.	2,400	2,300	2,400	2,300	2,600
Boost	Full Throttle	+3	Full Throttle	+3	+3
S.L. b.h.p.	156	165	245	245	265
All-out Level (5-min. limit)					
r.p.m.	2,500	2,400	2,500	2,400	2,700
Boost	Full Throttle	+3	Full Throttle	+3	+4
S.L. b.h.p.	160	168	250	250	286
Max. Cont. Cruise :	2,200	2,100	2,200	2,100	2,400
Boost	−1½ lb.	+2	−1½ lb.	+2	+3
S.L. b.h.p.	133	146	207	220	250
Max. Econ. Cruise :					
r.p.m.	2,100	2,100	2,100	2,100	2,400
Boost	−2 lb.	−1 lb.	−2 lb.	−1 lb.	+2
S.L. b.h.p.	114	107	176	160	235
FUEL CONSUMPTION (with C.S. Airscrew)					
Max. Cont. Cruise :					
Altitude (ft.)	2,000	5,500	2,000	5,500	6,000
b.h.p.	135	154	212	230	266
r.p.m.	2,200	2,100	2,200	2,100	2,400
Gall./hr.	10	11½	15½	17½	20⅛
Max. Econ. Cruise :					
Altitude (ft.)	3,500	11,500	3,500	12,000	6,500
b.h.p.	117	121	180	180	250
r.p.m.	2,100	2,100	2,100	2,100	2,400
Gall./hr.	7½	8	12	11½	16
Max. Take-off :					
Altitude (ft.)	S.L.	S.L.	S.L.	S.L.	S.L.
b.h.p.	160	197	250	295	330
r.p.m.	2,500	2,500	2,500	2,500	2,800
Gall./hr.	12½	17½	19⅛	27	30
Max. Climb :					
Altitude (ft.)	S.L.	S.L.	S.L.	S.L.	S.L.
b.h.p.	156	165	245	245	265
r.p.m.	2,400	2,400	2,400	2,300	2,600
Gall./hr.	12	13	19	20	21½
Max. Power Level Flight :					
Altitude (ft.)	S.L.	7,000	S.L.	7,000	6,000
b.h.p.	160	178	250	270	305
r.p.m.	2,500	2,400	2,500	2,400	2,700
Gall./hr.	12⅛	14½	19½	22	25
OIL CONSUMPTION					
Max. Cruise (pts./hr.)	1½ to 3½	2 to 4	3 to 5	5 to 10	8 to 14
Max. Level Flight (pts./hr.)	5	5	7	—	—

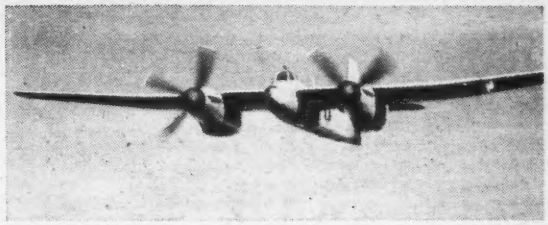
Bibby couplings were installed in the Maybach engines of the *Graf Zeppelin* after the forced landing at Toulon on the airship's voyage to America. Each engine was found to have a broken crankshaft, so these British spring couplings were fitted, after which the airship did some 600,000 miles without mishap. Dr. Derr, of the German Airship Factory, said that the couplings contributed largely to the ultimate success of the *Graf Zeppelin*—an admission worthy of note.

Reduction gearing on a six-cylinder in-line engine is not at all an easy problem to surmount, chiefly because there are three impulses in each revolution which makes the third order of vibration come within the normal operating speed range and thus almost always brings about a fairly large torque reversal. To condense the primary function of the spring coupling it may be said that: (i) It enables the largest possible resilience to be incorporated in a given space due to the whole of the spring being stressed; this not only provides a large capacity for shock absorption but also permits the principal resonant zones to be kept clear of the normal operating r.p.m. range. (ii) The detuning characteristics of the coupling provides for a reduction in peak amplitudes in the chief resonant zones which have to be traversed when starting or stopping. (iii) The mechanical design is based on a large background of industrial experience and is such that the spring element is protected from overstressing under occasional shock loads. Summing up, it can be stated that the coupling is introduced to ensure a great reduction in vibration at all speeds in the operating range, and this it definitely achieves—furthermore, as all the spring material is stressed the energy conversion is almost 100 per cent., whereas in no other known type of spring coupling is anything approaching this efficiency obtained.

This innovation is one that is likely to prove of more than passing interest, for it would appear to offer an uncomplicated and extremely efficient solution to the uncomfortable problem of employing a reduction gear on a six-cylinder in-line engine, and it may thus be appreciated why the Gipsy Queen 71 is the only geared six-cylinder in-line engine in existence as a production unit.

The Year That Has Passed

End of Two Wars : Aviation's Share in Victory : Technical Progress



HIGH FLYER : The Merlin-engined Westland Welkin built for interception at altitude.

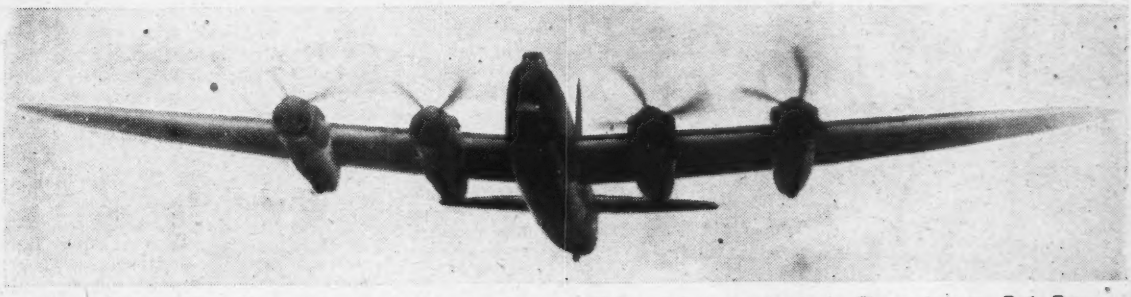
IT is the custom of *Flight* every year to publish in the last issue of December a review of the most striking events and tendencies of the past twelve months. From 1939 to 1944 these reviews have always had to end on the note "We hope that next year will see us nearer to peace on earth." It is an inexpressible relief not to have to sound that note any more. The two great disturbers of peace, Germany and Japan, have fallen in ruins. Heaven has blessed the arms of the United Nations with glorious victory, and the first great Freedom—freedom from fear—has been achieved.

The past six years have been one prolonged tragedy, an agony for mankind of which we in the British Isles have been spared the ultimate horror. We have not seen our people slaughtered and tortured wholesale, as the Poles, Czechs, and Russians have seen theirs. We have no Lidices to remember. Nevertheless, we have suffered much. The bombing of our cities has caused much pain and many tragedies. The losses of our sailors, soldiers, and airmen in combat and in convoy make one long tale of heartbreak. Now it is all over, except for troubles in Java and elsewhere. The fighting men are returning by degrees to their peaceful tasks, and the citizens can sleep in their beds without fear of being roused by air raid sirens. After so prolonged a trial it all seems too good to be true.

Yet, when we look back to the end of 1944 we must remember that there was no certainty of victory and peace before the next twelve months had run their course. Ultimate victory indeed was certain; but there was no feeling of assurance that both wars would be over before the end of 1945. Rundstedt was striking back savagely in the Ardennes. He had no real chance of driving the British and Americans out of France, because, as Sir Bernard Montgomery said afterwards, he attacked without having first won the battle of the air. He could not win that, because already the *Luftwaffe* was a spent force and had very little petrol. But when the year opened the bad weather over the Ardennes prevented the Armies of Liberation from making full use of their supremacy in the air. Even reconnaissance was often impossible for days on end, and the Allied commanders did not know what movements the enemy forces were making. On those dark days Rundstedt was able to get a certain amount of fuel and other supplies up to his front-line troops; but every now and then the sun shone through, and then the Tactical Air Forces and heavy bombers lost no time in getting to work and barring the roads and rails from the factories to the battle area. Even on the blind days the Allies' artillery could shell the roads and railway lines. By the middle of January the weather had improved, and then all that Rundstedt could do was to extricate as many of his troops as possible. In doing this he showed his skill; but none the less in March he was relieved of his command, and Kesselring took his place.

WORLD'S FASTEST : The Gloster Meteor which captured the speed record for Britain.

By that time the military position of Germany was hopeless. Rivers might delay the Americans and British in the West for awhile; but rivers are never an impassable barrier for armies which hold the whip hand. Airborne troops were landed behind the German lines at Eindhoven, Nijmegen, and Arnhem, while armour rushed up to join with them. At the two first-named places the landings were successful and helped the British to cross two rivers. Arnhem, as everyone knows, was a glorious failure, largely due to bad weather. The British did not then know all there is to know about the use of airborne troops; but they were quick to learn



VICKERS WINDSOR : The new four-engined bomber from the Vickers-Armstrongs hangars. The engines are Rolls-Royce Merlins (Series 85).

THE YEAR THAT HAS PASSED

by their mistakes. When it came to crossing the Rhine all went according to pl n with the airborne men, and the ground troops made speedy contact with them. The plan, in fact, had been good.

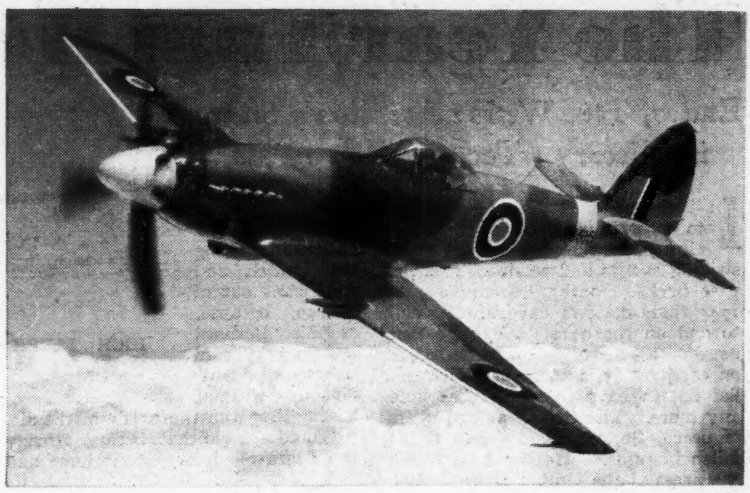
In the meantime the Russians had been pouring in at great speed from the East. Zhukov liberated Warsaw, Budapest was soon afterwards surrounded, and Danzig was captured with the help of what was called a huge Russian air fleet. Almost every night Mosquitoes flew over Berlin and dropped 4,000 lb. bombs. In mid-April British long-range fighters met Russian aircraft in the air and exchanged salutes with them.

In the midst of these victorious proceedings Franklin Roosevelt, the great President of the United States, died. All the United Nations mourned him; he had passed away, as Nelson had done, at the height of his glory.

Before April was out the "dim-out" was abolished in Great Britain, except along the coast. There was no more fear of piloted bombers coming to raid our island.

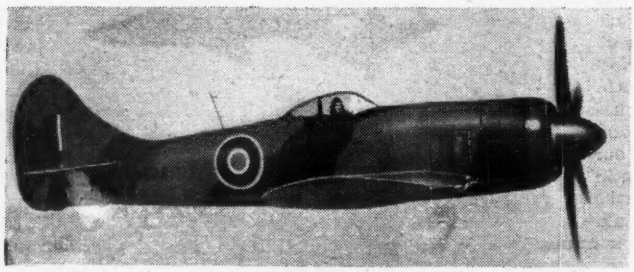
In the same month the *Lützow* was sunk at her moorings at Swinemünde by 12,000 lb bombs dropped by Lancasters of Bomber Com mand.

Shortly afterwards Göring was supplanted as head of the *Luftwaffe* by Col. Gen. von Greim. Göring had never been a great air commander, though he had been an able lieutenant of Hitler in organising internal affairs.



SPITFIRE'S SUCCESSOR: The Spiteful, which represents the highest development of a fighter with a piston engine (Rolls-Royce Griffon).

He had been completely misled by the fighting in the Spanish civil war into thinking that speed mattered more than armament for both bombers and fighters; he utterly mismanaged the Battle of Britain; and his expensive capture of Crete by airborne troops so weakened that branch of the German Army that the invasion of Russia had to be postponed.

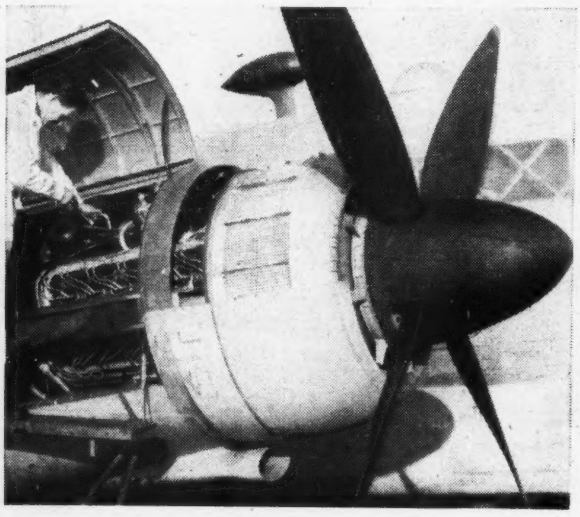


SLEEK ORTHODOXY: W. Humble test flying the Hawker Tempest II. The engine is a Bristol Centaurus.

Then news came thick and fast. The Russians from north and south joined hands at Potsdam, thus encircling Berlin. Gen. Mark Clark captured Verona, the key to the Brenner Pass. The Partisans from Milan or Turin captured Mussolini and shot him out of hand. Either before or soon after this Hitler, it seems certain, shot himself, and his body was burned.

Admiral Dönitz became Führer in succession to Hitler. Whether his succession was constitutional or not we need not waste time in enquiring. At any rate, when the Admiral decided that Germany must surrender unconditionally, and on May 7th ordered all forces to cease fighting and lay down their arms, nobody seemed disinclined to obey. The Germans had fought well up to the end; but they had had enough and were glad to surrender.

So ended the greatest war in the history of the world. A very short period of rejoicing was followed by a stern determination to deal with Japan as the United Nations had dealt with Germany. But Japan was already in a very bad way. At the beginning of May Rangoon was liberated. Burma as a whole had been released the wrong way, from north to south, because the landing craft which Admiral Mountbatten required had been wanted for the invasion of Normandy. But eleven months later it had been found possible to send enough of these craft out to the Indian Ocean. So Rangoon was captured from the sea, but as in all the later operations the three Services each played a part. Parachute troops, some of them Gurkhas, were dropped inland, and joined up with the men who had landed from the sea; while a contin-



IN GOOD CIRCLES: One of the latest type Napier Sabre engines installed in circular cowlings in the Vickers Warwick.

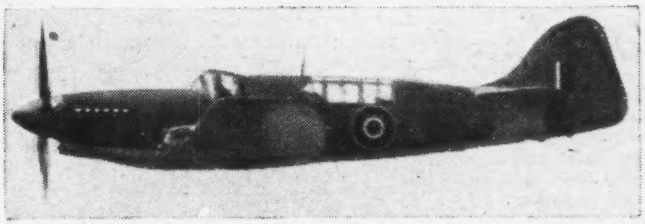
THE YEAR THAT HAS PASSED

gent of the Army which had captured Mandalay made a forced march southwards to the Capital. The remnants of the largest of all the Japanese Armies tried to escape into Siam, while the Eastern Air Command made their journey very unhappy and sanguinary.

Before May was out a Japanese force advanced and threatened Chungking. Two divisions of Chinese troops, consisting of 25,000 men and 1,500 pack animals, were promptly flown up from Burma in 1,500 sorties, and Chungking was saved. The use made by the United Nations of the air in the Burma campaign came as an utter surprise to the Japanese (and for that matter to everyone else) and it upset all their plans. The arrival of Spitfires took all the heart out of the Japanese fighter pilots, and the air was left clear for the British and Americans to use as they wished. Mountbatten's decision to fight on and fly on through the monsoon was one unexpected shock for the enemy, and the daring use of air transport and air supply was another. Never before had ground troops advanced through country devoid of roads and railways, trusting to aircraft to keep them provisioned and supplied. Never before had whole divisions with guns and pack animals been moved about by air as though they were knights on a chessboard. To use an American expression, the Japanese were outsmarted as well as outfought; and the smartest thing in this campaign was the use made by Mountbatten of the air.

ON SHOW ABROAD : Miles Aircraft Ltd. have shown much ingenuity in the design of the Aerovan, which is shown on display in France.

Meantime the Allies were closing in on the Japanese home islands. A statement in Washington said that the enemy still had 4,000 combat aircraft; but if so he made very poor use of them. The best device he could think of was to send suicide bombers to crash onto Allied warships. They did some damage, but not enough to affect the naval situation, and their own losses were very heavy. Superfortresses no longer needed to use their power of striking from afar. They could fill their fuel tanks from islands at a comfortable distance from their targets. In July the attack by the B-29 heavies gave way to attacks by carriers. Admiral Halsey's fleet, which included some heavy British ships, cruised daringly up and down the coasts of the Japanese islands, shelling and bombing at will.

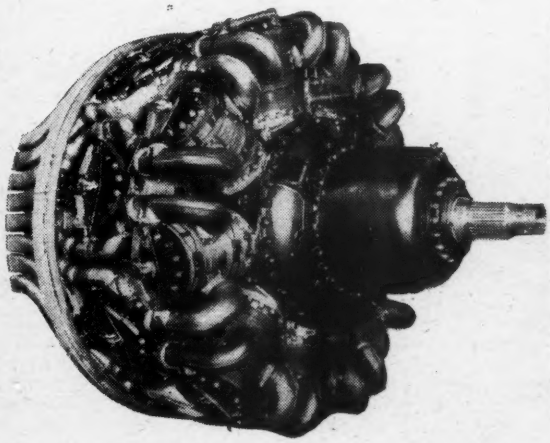


NAVAL TYPE : The Firefly IV with clipped wings and wing-root radiators. It is powered by a Rolls-Royce Griffon (Series 74) engine.

In the early days of August the United Nations at Potsdam sent an ultimatum to Japan, and about the middle of the month this ultimatum was accepted, and Japan surrendered unconditionally, provided that the authority of the Emperor was respected. The second great war was over.

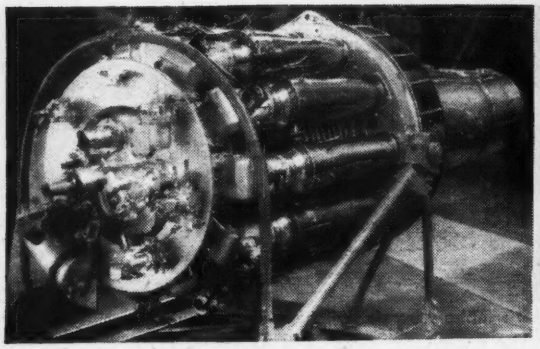
Before that happened, however, some very important events took place. Mr. Winston Churchill ceased to be Prime Minister of the United Kingdom, the U.S.S.R. declared war on Japan, and two atomic bombs were dropped from American aircraft on Hiroshima and Nagasaki. Actually, the Emperor Hiroshito had decided to surrender before either of these two events took place.

We must turn our thoughts from the battles to happenings in Britain. While still Prime Minister Mr. Churchill instituted for the first time a Ministry of Civil Aviation. Lord Swinton was placed in charge of it, and had, at short notice, to represent



SLEEVE-VALVED RADIAL : The Bristol Centaurus which is the power plant for many of the new civil and military types.

ECONOMICAL ELEGANCE : Low operational costs and high speed are the chief attributes of the Hercules-engined Vickers Viking.



ARMSTRONG SIDDELEY JET : The ASX gas turbine which has its air intake midway along the length of the engine.

RAPIDE REPLACEMENT : The D.H. Dove which is now undergoing extensive trials before being marketed. It is a most economical type suitable for feeder-line work.

THE YEAR THAT HAS PASSED

the British case at the Chicago Conference. Then the Socialist Government came into power, with Lord Stansgate as Secretary of State for Air and Lord Winster as Minister of Civil Aviation. The new Government lost no time in announcing its intention of nationalising British civil air lines, charter flying and private flying being excepted. Lord Swinton has announced that if and when a Conservative Government is returned to power it will undo the work of the Socialists. This statement added to the confusion with which B.O.A.C. and other prospective operators regarded the future.

In any case, the United States operators were bound to have a good start over their British competitors, as British constructors had for six years devoted all their energies to producing aircraft for military purposes, while some useful civil types were still produced in the States. However, some sound British designs are emerging, and, given time, there is no doubt that British aircraft will hold their own against the world.

In this connection it is gratifying to reflect that the Gloster Meteor with two Rolls-Royce turbine jet engines recovered for Britain the world's high-speed record, with a speed of 606 m.p.h. Almost immediately afterwards the world's long-distance record, so long held by a Vickers Wellesley, was captured by the Americans, who flew a Superfortress from Guam to Washington, 8,198 miles, in 35 hours 5 minutes. Technical development in general during the past year is dealt with below.

From the point of view of commercial air transport the year ends in uncertainty and a look-out that is not too cheerful for Britain. But this does not spoil the overwhelming thankfulness we all feel that 1945 has seen the victorious ending of the wars against Germany and Japan.

TECHNICAL PROGRESS

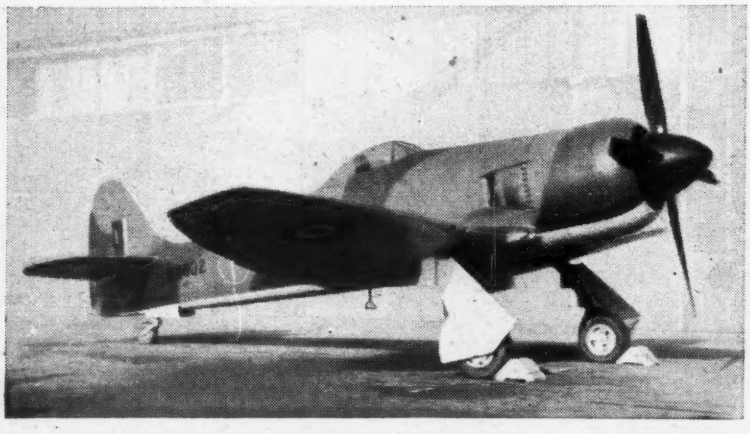
FROM many points of view the year which is just closing has witnessed some of the greatest steps forward ever recorded in any one year of the history of flying. Gas turbines and jet propulsion have initiated a revolution as great as that which was begun when Wilbur and Orville Wright first succeeded in remaining airborne for a few seconds more than 40 years ago.

Largely due to the finish of the European and Japanese wars, and the consequent release from most of the burdens imposed upon technical journals by considerations of security, *Flight* has been able to record during the year much of the progress made in the many and varied aspects of flying, as the following brief review will show.

The general problems of gas turbines and jet propulsion were discussed in lectures by Air Commodore Banks to the R.Ae.S. and by Dr. Hooker of the Rolls-Royce turbine department. A whole series of articles on various aspects of jet propulsion and jet-propelled aircraft at home and abroad by G. Geoffrey Smith was published at intervals during the year, and within the last few weeks we have had another series, by Sir Roy Fedden, on what he saw and heard during a tour of Germany. Air Commodore Frank Whittle disclosed in a lecture to the R.Ae.S. some of the struggles which finally resulted in recognition of the validity of his theories, and the whole picture of the British aircraft industry's contribution to the present state of the art was painted by Dr. Roxbee Cox in his Wright Brothers lecture to the American Institute of the Aeronautical Sciences.

In a rather more specific way we have been able to publish detailed descriptions of the Rolls-Royce Derwent V jet units which powered the Gloster Meteor in the successful world's record attempt mentioned above, each giving a thrust of not far short of 4,000 lb. Similarly, the de Havilland Goblin jet engine which powers the de Havilland Vampire fighter with a thrust of 3,000 lb., and the Bristol Theseus, a turbine/airscrew unit in which there are separate drives for the airscrew and the compressor, a combination which results in lower fuel consumption and greater thrust for take-off and initial climb.

German gas turbines and jet units are generally much more complicated than their British equivalents, largely due to German lack of suitable



HAWKERS' SECOND FURY : Much loved of fighter pilots in the 1930s, the original Fury was a biplane. The 1945 model with Centaurus 18 engine is a worthy successor.

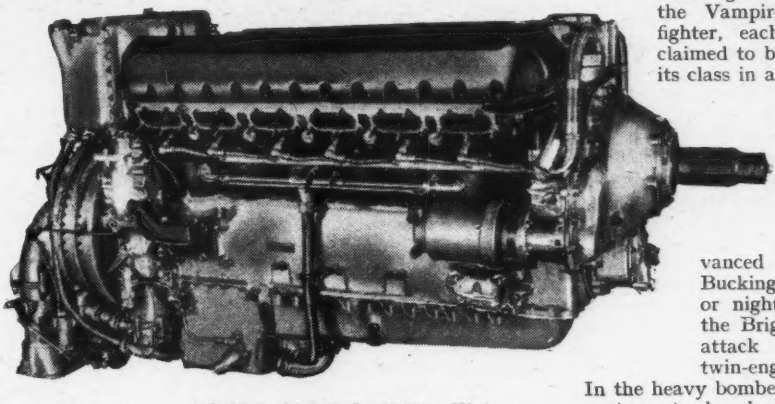
materials. They show, however, certain features which may be useful for future development. There is little doubt that in the matter of gas turbines and jet engines Great Britain has established a position well in the forefront. The next important step will be their utilisation in aircraft specifically designed to make the most of these new forms of power plant.

The tremendous progress made with gas turbines has tended to overshadow the very real merits of the new types of piston engine of which it has become possible to publish details during the year. For example, there is the Bristol Centaurus 18-cyl. sleeve-valve air-cooled radial, which develops well in excess of 2,500 h.p., and the Napier Sabre "H" engine which, in the Mark VII version, gives more than 3,000 b.h.p. for take-off and which is thus probably the most powerful piston engine in the world. The Rolls-Royce Griffon 65 two-stage, two-speed engine gives a maximum of 2,250 h.p., or 60.5 h.p. per litre of swept volume, which is probably the highest ever achieved.

Whatever may be the future fate of the high-power piston engine *vis-à-vis* its turbine counterpart, it appears that in the lower powers it will hold its own for a long time to come. Here the private owner will be well catered for, as well as the flying clubs and the operators of feeder lines. The Cirrus Engine Co. offers four models in the Minor and Major classes, ranging in power from 90 to 155 b.h.p.; and in this issue we publish descriptions of the new range of de Havilland Gipsy engines which give an even wider range of powers.

From the point of view of re-equipment it is in the Naval Air Arm that the greatest progress was made during the year. That was, perhaps, but natural in view of the fact that this Service had a lot of leeway to make up, but it has certainly shown itself determined to equip itself with the best of everything. At a demonstration held at Heston in October many of the latest aircraft types were shown. There was the Fairey Spearfish torpedo-bomber, the Blackburn Firebrand, the Fairey Firefly IV, and the Seafang, the naval version of the Supermarine Spiteful. The Sea Fury is a development of the Hawker Tempest II.

THE YEAR THAT HAS PASSED



POWER FOR FIGHTERS: With a dry weight of less than 1 lb. per horsepower, the Rolls-Royce Griffon (65) develops a maximum of 2,250 h.p.

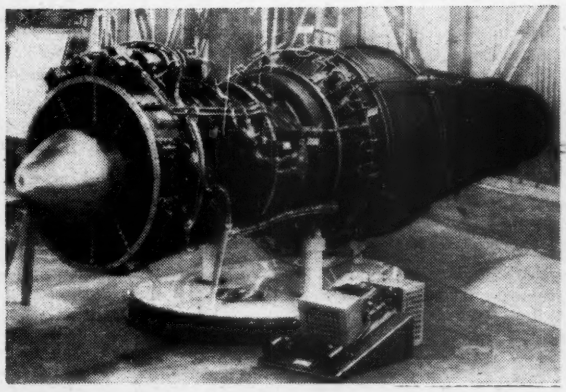
In the twin-engined class of aircraft the Navy has the de Havilland Sea Mosquito, and the new Sea Hornet long-range fighter. And finally, and most impressive of all, there is the Sea Vampire, which was recently the first jet-propelled aircraft to land on and take off from the deck of an aircraft carrier.

The accession to the strength of the Royal Air Force has not, perhaps, been quite so spectacular, but during the year we were able to describe in considerable detail several new types. From the Hawker "stable" came two formidable fighters, the Tempest V with Napier Sabre engine and the Tempest II with Bristol Centaurus. Supermarines contributed the Spiteful fighter with Griffon engine and laminar-flow wings. From de Havillands came the Hornet long-range twin-engined fighter and the Vampire jet-propelled fighter, each of which is claimed to be the fastest in its class in actual service.

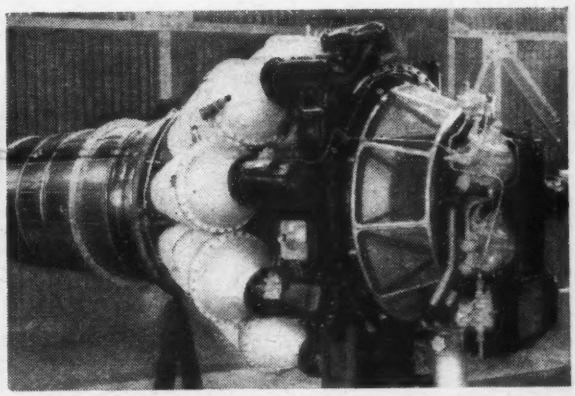
Three Bristol types for the R.A.F. were described during the year: the Buckmaster high-powered advanced trainer; the Buckingham fast day or night bomber; and the Brigand long-range attack monoplane, all twin-engined types.

In the heavy bomber class the only new type to be described in some detail was the Avro Lincoln II, which carries a far greater load than its predecessor the Lancaster (22,000 lb.) and has a radius of action of something like 1,500 miles, cruising at very high speed. Its maximum loaded weight is more than 75,000 lb.

There is a general impression that Great Britain is far behind in the matter of civil aircraft. That is only partly true. Of entirely new types specifically designed for air transport there are not many as yet, but several are coming along, and some extremely successful conversions have been produced by several firms. For example, Avros produced the Lancastrian for B.O.A.C. Handley Page introduced a civil version of the Halifax, and



EARLY AXIAL: The Metropolitan-Vickers gas turbine which was the first British type with axial compressor unit to fly.



BRITAIN'S BIGGEST JET: The Rolls-Royce Nene is the successor to the record-breaking Derwent. It develops 5,000 lb. thrust and has been flown in the Shooting Star.

THE YEAR THAT HAS PASSED

Shorts have converted, very successfully, the Sunderland flying boat into the Sandringham and Seaford passenger-carrying civil machines, while a civil version of the Stirling bomber has also been announced.

Of the new transport types four have already made their first test flights. They are the Vickers Viking twin-engined machine, the Avro Tudor I four-engined machine for the North Atlantic, the de Havilland Dove, a small twin-engined feeder-line type designed for very economical operation. And the Bristol Freighter made its first test flight recently, and a large production programme is in hand for this machine. Mention should be made here also of the Handley Page Hermes, the prototype of which crashed on its first flight, but the second of which is coming through the shops.

The Airspeed Ambassador (A.S.-57) will be a large twin-engined type with two Bristol Centaurus engines and a gross weight of 45,000 lb. Its "formula" is such that it would appeal to many American operators, and it is not beyond the bounds of possibility that it might be exported, thus achieving a triumphant delivery of coals to Newcastle!

Shorts have the huge Shetland flying boat, the first of which is now being tested as a military machine, but a second is in a fairly advanced stage at the Rochester works. The maximum loaded weight is 130,000 lb.

In the smaller classes of civil aircraft there are several interesting types. Export has already begun of the well-established Percival Proctor, and Miles Aircraft have demonstrated some of their small machines in France. This firm has also produced the unusual Miles Aerovan, a small cargo or passenger machine with a short nacelle and tailbooms. Taylorcraft lost no time in announcing its civil version of the Auster, a small and very robust monoplane, economic to operate and easy to fly.

PROTOTYPE AIR LORRY: The first Bristol Freighter is now undergoing flight trials. A passenger version of the same aircraft is to be known as the Wayfarer. A very considerable production programme has been laid down.

The event of 1945 which drew the attention of the whole world was, of course, the setting up of a new world's speed record by Grp. Capt. H. J. Wilson on a Gloster Meteor powered by two Rolls-Royce Derwent jet units. Over a measured course at Herne Bay he averaged a speed at first given out by the Royal Aero Club as 606 m.p.h. The figures were submitted to the F.A.I., who homologated the record at 975,675 km./hr. (606.262 m.p.h.).

This speed does not represent the maximum of which the Meteor is capable, and Mr. Eric Greenwood, Gloster's chief test pilot, is now beginning a series of test flights at altitude in order to determine how much farther the machine can be pushed without running into serious compressibility troubles. In the record flights the Meteor was flying at a Mach Number of just over 0.80 at sea level. By diving it from great heights, the same speed would correspond to a higher Mach Number because the speed of sound decreases with altitude. (The Mach Number speed at any height is the percentage of the speed of sound at that height.)

One of the great problems of post-war air transport is that of combining long range with a useful payload. It is generally agreed that this can most easily be achieved by using very high wing loadings, but these in turn may extend the length of take-off run unduly. It may then become necessary either to use some form of assisted take-off or, as an alternative, to refuel the aircraft from a flying tanker after it has taken off. Sir Alan Cobham has developed this system, which can be used to increase the payload still farther by "topping-up" the tanks of the transport machine at points along the route.

TEST PILOTS' PARTY

DESIGNED primarily as a send-off party to the outgoing course, the Empire Test Pilots' School dinner at Cranfield on December 14 also provided very adequate means of returning hospitality and of still further interesting the aircraft industry and others in the vital importance of the School. For, curiously enough, one gathers that this interest is not quite as great as it might be, either amongst the firms or even in the Air Ministry itself.

The fact that, particularly to-day, test pilots need to learn their business—in the long, hard and wasteful school of trial and error, or in an organisation such as the E.T.P.S.—has not yet been fully appreciated. The writer spent five years learning probably rather less than is learnt by an E.T.P.S. pupil in the nine months of his course.

Certainly, the guests—including a very fair representation of our better-known civil test pilots—obtained a more than good idea of the scope both of the curriculum and of the School's widely divergent pupil intake. Not only were R.A.F., R.N., Dominion and civilian pilots represented on the recent course, but the pupils also included U.S. Army and Navy, Chinese Air Force, Netherlands, Belgian and French pilots. In fact, the McKenna Trophy, presented to the best pupil on each course, went to Sqn. Ldr. D. R. Cumming, an R.A.A.F. pilot. This trophy, in memory of Grp. Capt. McKenna, a previous Commandant of the School, who lost his life in a flying accident, was presented at the dinner by Air Marshal Sir W. Coryton, the Controller of Research and Development, after introductory and explanatory remarks by Grp. Capt. H. J. Wilson, A.F.C., the School's Commandant.

Other speakers were Air Comdre. Frazer, the A.O.C., who had flown up from the School's previous home, Boscombe Down; Sir F. Handley Page, speaking for the industry; and Rear Admiral M. S. Slattery, for the Royal Navy. Since we were present largely in an unofficial capacity it would be unseemly to report the speeches which, designed as they were for internal consumption only, were amusing and pointful as such unprepared and from-the-heart remarks so often are.

With the arrival, early next year, of the new Aeronautical College, it would seem that Cranfield will be a convenient and practical home for the E.T.P.S. The College will offer more extensive means of theoretical instruction to parallel the practical work of the pupils, and Cranfield itself is adequately provided with buildings, runways and general facilities. The School's working fleet of aircraft includes types as widely different as a Tiger Moth (for glider towing) and Meteors. The primary difficulty, with the gradual reduction in strength of the R.A.F., is that of keeping the aircraft serviceable rather than in obtaining a sufficiency of types. The next course begins on January 3.

ANGLO-AMERICAN ANGLE

America Misunderstands

An Englishman in the States Appeals for a Clear Exposition of Our Air Transport Policy

THERE are hard words flying around these days regarding British aviation policy in Europe and elsewhere. Wayne W. Parrish had some frank things to say in a despatch from Paris in the November 1st issue of *American Aviation*. For the sake of the record and so that we may see ourselves as others see us, the following are some quotations from the article in question.

"If the airways communications system in Europe is based on U.S. equipment and procedures, the United States will have made an invaluable penetration of European civil aviation. . . . We have earned the right to fly commercial transport planes around the world in the interest of American flag commerce. We must insist on the exercise of these rights. We are meeting ample opposition from Britain in several key spots—and not the kind of sporting opposition which one should expect from an ally we aided in great need—but, fundamentally, we are getting what we have asked for. . . . Britain is far more interested in blocking American commercial airline expansion than in seeing that the world is provided with fast, efficient and inexpensive transportation around the globe."

Another article, written over the initials "W. W. P.", contains the following:—"And it seems clear that Britain is not making friends these days with such countries as Sweden, Netherlands and Belgium by its arbitrary air transport demands. . . . The British have so far been unable to explain satisfactorily their demand for their quota proposal in air transport, except that they don't have the aircraft to fly and hence want everyone else to wait in the interim."

To an Englishman, particularly an Englishman in England, these might seem to be unduly harsh judgments, but when viewed through American eyes, and in the light of American experience, they appear more logical. For lack of a better explanation the average American can only think that we are adopting an inexcusable dog-in-the-manger attitude.

Competitive Co-operation

To those of us who feel that full understanding (and, therefore, full co-operation) between England and America is a vital necessity, all this bickering is an unhappy and unnecessary proceeding, and does, perhaps, originate directly from a lack of knowledge of the other fellow's viewpoint. The Americans realise that Great Britain will be their chief competitor both in the manufacturing and the airline fields, and this, combined with a very deep-seated (if erroneous) belief that there is always some sinister behind-the-scenes, perfide-Albion motive in everything we do, is inclined to make them jumpy and unduly sensitive. The only way to prevent wrong conclusions from being drawn is to be perfectly honest as to why we do, or don't do, certain things

It may be that, in England, there has been a clear and open statement as to why we are sticking to our decisions —as to why we have prevented certain foreign airlines from running as many services as they wished into England; as to why, for some considerable time we would not let Swedish and other airlines land at Gandar—but if there was such a statement, it certainly never reached the majority of those interested over here in America.

Surely it should be possible to see that the British point of view is presented to the American aviation trade through their newspapers and periodicals (of which there are many) in such a way that, even if they don't agree with the outcome of our policies, they do at least understand the reasons that prompt us to formulate them. To do this successfully it would probably be necessary to appoint a trained aviation newspaper man to some accredited British organisation in the States. He might perhaps be a member of the Civil Air Attache's staff, whose duties at the moment do not include the field that is supposed to be covered by the British information services. It would be necessary to keep this Press representative fully up to date on all British aviation policy and manufacturing developments. It would be up to him, also, to refute the incorrect and often harmful statements that appear in the American public Press in connection with our two countries' aviation matters.

How It Happens

An excellent example of such statements occurred lately when the widely read *New York Sun*, an evening paper, announced under a signed despatch from London that the American air operators were being deliberately prevented from using Bovingdon, with its short run to London, and were being forced to land at Hurn, despite the fact that Bovingdon was "built with the American taxpayers' money"! Instead of the correct facts required to refute these statements being immediately available, it was nearly three weeks before the British Embassy was able to issue a statement to the effect that Bovingdon could not be used by the Americans because the American Transport Command itself would not give it up, and that, anyway, Bovingdon was built and paid for by the British taxpayer. By that time much of the value of such a statement was lost.

All this is very silly and quite inexcusable. The fault does not lie only in the States. If accurate reporting on British developments is to be expected in the world outside, then the material on which such reports can be based must be readily available. One sometimes wonders whether it is.

There is a strong feeling here in America, and perhaps a justified feeling, that the British are much too much inclined to retire behind a proverbial reticence and to adopt an aloof "holier-than-thou" attitude, and to take the line that, because it's British, no policy or development needs explanation. This attitude is guaranteed to make other nations, who believe it to be a manifestation of snobbish superiority, hopping mad. The sooner we realise that a little extrovert discussion may make all the difference between stifling or developing aviation co-operation, the better.

"KIBITZER."

STATISTICAL COMFORT

THE Safety Bureau of the American Civil Aeronautics Board has just completed a study of recent light aircraft accidents in the U.S., and the results of this will be comforting to those who suspect that ex-Service pilots are likely to suffer more accidents while changing over from military types to less amply-powered and controllable civil aircraft.

During the period between January and October, 1945, there were 400 of such "serious and fatal" accidents in America. Of this number only 17 involved "military pilots," and none of those 17 could be charged directly to any "loss of familarity with the aircrafts' characteristics." Among the 1,611 "minor" accidents which occurred during the first six months in 1945, 33 involved "military pilots," but only two of these could be attributed to a "loss of familiarity" cause.

In their conclusion the C.A.B. make it clear that the data available certainly refutes the popular belief that ex-Service pilots are experiencing any difficulty in the U.S., or that they are showing themselves to be any more careless than civilian-trained pilots. Nevertheless, the number of accidents and incidents caused by reckless flying forms a very high proportion of the total, and the stigma must be applied equally to all private pilots.

CIVIL AVIATION NEWS

BERMUDA CONFERENCE

HEADED by the Deputy D.G.C.A., a British party recently left for Bermuda to discuss various aviation matters of importance to the British, Canadian and Newfoundland Governments. Among the points being discussed have been those concerning the transfer of the Newfoundland and Labrador airfields to civil control. Lord Winster was due to follow last week.

THE NEWEST FAIRCHILD

SO many American light aircraft types are either available or going into production that it would be invidious to pick out any single example for description. The new Fairchild F-24 is, however, of unhappy interest since, in Warner-engined form, it is being sold in the U.S. for the equivalent of something over £2,000. Quite a number of these aircraft were available when the A.T.A. ceased operations and could probably have been sold for a few hundred pounds each. Unfortunately, the lease-lend agreement prevented any such sale, and one supposes that these aircraft will be broken up. The F-24 is very fully equipped at the price, and the equipment includes a turn indicator and a rate-of-climb indicator as well as a sensitive altimeter. In its other form the Fairchild is fitted, as in pre-war years, with a Ranger inverted six-in-line.

CRITICISMS FROM AUSTRALIA

THE kind of thing that may happen in civil aviation when serious wire-pulling starts is suggested by a note from a correspondent in Australia describing the position of the Rose Bay Qantas flying-boat terminal. Apparently, the growth of this organisation during the war necessitated the erection of additional hangars, and a new one had been almost completed when V.P. day (P for "Pacific") arrived. About two-thirds of the roof still remained to be placed and the doors installed.

According to our correspondent, the people in the vicinity, who have bitterly opposed the base since it was first opened, paid a special visit to Canberra and the work on the hangar simply stopped. So valuable flying-boats are still left out in the open.

There seems to be some strong feeling, also, about the failure of the Australian Government to arrange for a service to take over that operated by R.A.F. Transport Command across the Pacific. The reason given is that there are no available aircraft. An air service between Australia and America should certainly have considerable commercial advantages. In the meantime, Australian National Airways have offered to start such a service in March, using Skymasters, if the Government will give them permission.

BOATS PREFERRED

QUITE a few pleasant things were said about flying boats in general, and a number of interesting facts given, by Capt. R. C. Parker, of B.O.A.C., in the course of a commentary on the film "Flying Boat Over Africa," recently shown to the Medway branch of the R.Ae.S.

For instance, he said it was an encouraging sign of a still bright future for the flying boat when large numbers of passengers were at present showing preference for the Cairo route to South Africa, though this flying-boat service took some two days more for the run than that on which newer and faster landplanes were used. During the war the "C" class boats have been stripped of their cabin furniture, thereby increasing their capacity to about 30 passengers—or an equivalent payload of about 7,000 lb. The rigid structure of the Empire boats was still preferred by pilots, in rough tropical conditions, to the more flexible modern types, and Capt. Parker said that he and his colleagues were ready to take Empire boats through any weather. Empire boats had taken bump landings up to 6G during monsoon conditions.

It is perhaps not very well known that the "C" class flag ship, *Canopus*, is still going strong and has, in fact, recently celebrated her two millionth flying mile—and ninth C. of A. Of the original twenty-eight Empire boats delivered to Imperial Airways in 1936-37 some fourteen are still flying. Of the remainder, nine or ten were east of Singapore during the Japanese advance and were lost, directly or indirectly, on war service

WEATHER EXPERIMENTS

SINCE September a somewhat special service has been in operation daily between Prestwick and Blackbushe, near Camberley. Though primarily intended as a means of conveying V.I.P.s and urgent freight between the Scottish Atlantic terminal and the London area, this Transport Command service has also been used for experimental work on different forms of radio navigation and approach systems.

Two Dakotas are flown by three ex-24 Squadron crews, and valuable data is being accumulated which should help the Ministry of Civil Aviation and others to decide on a measure of radio standardisation. The flight navigation is normally completed on Radar "Gee" unless the run must be made at low altitude, when "radio track guides" are used. At the end of each run, whatever the weather, a practice blind approach and landing is made. So far the service, which is known internally and inevitably as the "twitch airline," has been run without cancellation on a single day.

TRANSPORT REQUIREMENTS

ON October 25th we published general information on the requirements which will eventually be demanded of manufacturers to cover "airworthiness" in American civil transport. Two additional decisions have now been made by the Civil Aeronautics Board.

The first of these concerns the minimum rate of climb to be obtained at continuous power at 5,000ft. or at a height figure equal to that of 1,000ft. in excess of the highest ground on any particular route. The second makes an operating rule that any aircraft with four or more engines will not be despatched over a route from any point along which a suitable landing area cannot be reached within 90 minutes when flying at a greater load than that which will permit a definite rate of climb, on maximum continuous power, with two engines inoperative—and, while flying 1,000ft. above the highest ground on the route, or above 5,000ft. A.S.L. This requirement involves either a reduction in all-up weight to the necessary figure within the first 90 minutes after take-off, or the ability to dump fuel while still retaining enough to reach a landing field within the hour and a half stipulated.

AMERICA'S FLYING START

PRACTICALLY every internal airline in America (writes a New York correspondent) is making application to extend its operations outside the country. Pennsylvania Central want to run to the Orient by the northern route. So do Northwest Airlines. T.W.A want to extend from India to China and thence around the world. Within two years the estimated American-operated world mileage will be 170,000.

In the internal sphere of operations, the Civil Aeronautics Board announces that, for the eight-month period ending August 31, 1945, mail ton-miles flown have increased 42.64 per cent., express ton-miles increased 51.61 per cent. and revenue miles 55.59 per cent. The revenue passenger miles have increased 58.60 per cent., and, in that same period, the airlines flew 94.95 per cent. of their scheduled mileage. The percentage of seats occupied on a revenue passenger load factor basis was 88.67 per cent.

The lowering of domestic fares has brought in an entirely new class of passenger and reservation requests have risen 200 per cent. since the war's end. The American Air Transport Association has announced a plan whereby the existing 573 airline ticket offices can be tripled. By June, 1946, there should be at least two thousand offices where passengers can arrange and obtain air transport.

RADIO STANDARDISATION

THE Governments of France, Egypt and the U.S. have been invited by the Provisional International Civil Aviation Organisation to organise regional meetings with the primary object of evaluating the type and location of air navigation facilities needed for the operation of international air services.

In particular, it is essential that agreement should be reached amongst all states over the types of radio aid that are to be used both for route and approach guidance. Without such an agreement the various airline operators may find that they will have to provide duplicate installations, and so waste both money and payload. It will be necessary to the success of any discussions that they should be conducted on a purely technical level amongst experts before decisions can be reached in legalised form.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

COCKPIT CLASSIFICATION
Forcing the Hand of the Designer

ALTHOUGH I cannot feel that Flt.-Lt. Gordon White's suggestion for group colouring in the cockpit ["Cockpit Classification," p. 630a, *Flight*, December 13th] will be practical for more than one or two present-day types, such a system would, in effect, force the manufacturers to proceed with some form of control and instrument grouping. And that is the essential need.

One can imagine the thoughts of a designer of an aircraft with a not very well planned layout on seeing the finished results—with red, blue, yellow, green, purple and brown splashes all over the driving compartment. The mere sight of it would force him to have the aircraft wheeled back to the experimental shop for drastic internal modifications.

Since it is obviously impossible to standardise control layouts, it only remains for designers to try to simplify them by grouping rather than by any ingeniously direct simplifying efforts such as were made for the benefit of the fighter pilots during the war. J. B.

ULTRA LIGHT AIRCRAFT
What are Their Prospects in Britain ?

MOST of your readers may remember that certain ultra light aircraft of the pre-1939 period used to fly quite legally without C. of A.

The position was, I believe, that they were covered by the issue of a "Permit to Fly" certificate in conjunction with an adequate third-party insurance.

Having been in correspondence with the Ministry of Civil Aviation on this topic, I understand that this concession is not likely to be renewed, and that such aircraft may have to conform to normal C. of A. requirements.

Whatever may be the reason (and I do believe the Ministry are sincere in their wish to see private flying safely established) one cannot help feeling disappointed at the possible abolition of "pop-bottle" aircraft in its entirety.

Can your readers enlighten me, therefore, as to the prospects of such aircraft as the "Drone," "Luton Minor," and so on, being made acceptable to the Ministry under these new possible requirements? "PERPLEXED ENTHUSIAST."

FUTURE OF THE R.A.F.
Humanitarian Task This Winter ?

"ONE of life's deepest contentments is to know your job." Thus runs the first sentence of a pamphlet just issued throughout the R.A.F. as part of the campaign for increased recruitment into regular service.

The statement is simple, the reasoning logical, but nevertheless I feel that its very truth, being the basis upon which the whole campaign is being conducted, inevitably leads towards another truth, the reasoning of which is also logical, namely, that whilst contentment can be achieved in service, such service must be utilised and directed toward a definite purpose.

Does the R.A.F. to-day have this definite purpose? I think not. The situation is understandable. Development of battle aircraft is progressing admirably in the technical field. But the extent to which these aircraft are to be produced, deployed and (perish the thought!) employed, necessarily depends upon the ultimate success, or failure, of the U.N.O. The age of the atom is also the age of the ultimate! Meantime both Fighter and Bomber Commands are virtually at a standstill.

Transport Command is in an even less advantageous position, although still operationally active. It will be remembered how public opinion, as represented by the Press and backed by a Government anxious for quick results, pointed to airfields full of machines "doing nothing," and demanded that the R.A.F. (meaning Transport Command) should do its utmost to repatriate as many Servicemen as possible as quickly as possible.

The utmost has been done, but accidents have occurred; too many accidents, according to the newspaper headlines. That same public opinion now demands to know the "facts," failing, I feel, to realise that when an organisation like Transport Command—a vital war machine—loses the respect which it gained during the war, and seems to be in danger of becoming a public utility rather than the branch of a Service, it is then subject to all the human failings and general lack of spirit which unfortunately characterise our public utilities to-day. Small wonder that the transport pilot slugging it out on an air route, and the mechanic on some remote staging post, both of whom worked through hell-fire, and derision, and are still faced with derision, feel *maleesh*. Apparent slowness of demob. is a further aggravating factor in many cases, but not, I contend, the predominant one.

What, then, of the future? So far, one surmises, the policy and practice of our peacetime Air Force have yet to be decided.

But on the broad question of principle my view is that furtherance of aviation as an instrument of humanity should be the guiding rule of the Royal Air Force in the future.

These are words which have been said before, and by more distinguished persons than myself. I have yet to find any real indication that their meaning has been fully understood and appreciated. The idea is, of course, idealistic, but so, in its elements, is the idea of a United Nations Organisation.

That is the theory, and I submit that its practical application can be demonstrated in Europe to-day, although "to-day" is already rather late. I have recently spoken to relief workers who face the prospect of the winter months in the devastated areas of Europe with undisguised fear and anxiety. They all speak of the necessity for a vast air transport relief force, to be brought into action when all else fails. They seem to be reasonably certain that all else will fail.

Surely this is the supreme chance for the Royal Air Force to prove its worth, and the worth of aviation, in peace as well as in war. Were this chance to be taken, I am sure that no future problem would be too great for the R.A.F. The foundation would have been laid. It would be a privilege to serve, because all service would be directed towards a definite purpose. "ICHTHUS."

SHOCK TACTICS FOR SHOCK WAVES
Topping the Mach Number Limit

"STRESSMAN'S" letter in the issue of December 13th appears, curiously enough, to have been at least partially answered by "Indicator" in his article "Shock Tactics for Shock Waves" in the previous issue. Although I cannot say that I entirely agree with the latter in his suggestion that, in order to make any real progress, aircraft design will require radical modification, "Indicator" appears to have stated the general situation with accuracy. He also cited the case of the R.A.F. Spitfire mentioned by "Stressman" in his letter.

Certainly, the obtainment of good characteristics at really high speed seems still to be very much a matter of luck in design. Compressibility had hardly been considered in the days when the Spitfire was laid down so it would hardly be fair to give the designers of this aircraft, or even those of the Meteor, any particular credit denied to those responsible for later attempts to provide better high-speed qualities.

It would be interesting if the ordinary semi-technical person could be given the safe Mach numbers actually reached by half a dozen modern types, but no doubt there will be danger in this, since everything would depend on the meaning of the word "safe."

In the editorial note to "Stressman's" letter it is suggested that the Spitfire figure of 0.92 had been over-estimated—presumably through a miscalculation of position error. Be this as it may, on test flights we dived all production Spitfires at speeds up to 470 m.p.h. and, as diving tests could not always, for reasons of weather, be carried out at medium altitudes, these had occasionally to be started at 20,000 ft. or more. Yet only very rarely did we suffer slight compressibility nose-down effects.

An A.S.I. figure of 450 m.p.h. at 20,000 ft. gives, if my calculations are correct, a Mach number of about 0.86. One hears that the Gloster people feel quite confident about putting up the Meteor's record speed by a very considerable margin when and if necessary. So, if we take this "considerable" margin as being, say, 34 m.p.h., the Meteor's safe Mach number would therefore be 0.84.

Both these figures are a great deal higher than any that have been rumoured for any other types in existence. I believe, for instance, that the P-80 Shooting Star is limited, on handling grounds, to a figure of 0.75, though, no doubt, this could be considerably improved by detail modification for any speed attempt.

So we do not appear to have progressed very far.

Ex-S.T.P.

Royal Air Force and Naval Air Arm News and Announcements

SERVICE AVIATION

"Flight" photograph.

FOR THE FLEET : A Barracuda and a Sea Vampire ranged on the deck of H.M.S. *Ocean*, 14,000-ton light carrier. It may not be long before the Naval Air Arm is equipped with British aircraft only.

New Hong Kong Appointment

AIR COMDRE W. A. D BROOK, C.B.E., who has been appointed A.O.C., R.A.F., Hong Kong, is 44 years of age, and is well known in York, for he commanded the Halifax Bomber station at Pocklington and later became S.A.S.O. at Headquarters, No. 4 Group.

When Bomber Command completed its work in Europe, Air Comdre. Brook went overseas again, this time to Headquarters, Air Command, South-East Asia, Kandy, Ceylon. While at Kandy he also filled the post of Director of Plans (R.A.F.) at the Supreme Allied Commander's Headquarters.

For his service with Bomber Command, Air Comdre. Brook was awarded the C.B.E. in 1944.

Awards

Royal Air Force

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations:—

Second Bar to Distinguished Flying Cross

Act. Sqn. Ldr. T. J. BROOM, D.F.C., R.A.F., No. 163 Sqn.—This officer has a long and distinguished record of operational flying. He first flew against the enemy in September, 1939, and since then he has completed a large number of day and night sorties against heavily defended targets in Germany. On one occasion he was forced to leave his aircraft by parachute and another time his aircraft crashed in occupied territory, but he evaded capture and returned to this country, where he resumed operational flying with undiminished enthusiasm. The sterling qualities of courage, leadership and devotion to duty displayed by Sqn. Ldr. Broom have materially contributed to the operational efficiency of each squadron with which he has served. In addition his work as squadron navigation officer has been worthy of the highest praise.

Act. Sqn. Ldr. R. VAN DEN BOK, D.F.C., R.A.F.V.R., No. 214 Sqn.—This officer has a distinguished record of operational flying. His enthusiasm for operational flying was not diminished by his experiences in evading capture after being shot down by anti-aircraft fire whilst over occupied Belgium during his first tour of duty. Since the award of a bar to the D.F.C. Sqn. Ldr. Van den Bok has flown on many sorties against strongly defended targets in Germany, including Berlin. He is an excellent captain of aircraft and flight commander, who has at all times set an inspiring example by his enthusiasm, courage and devotion to duty.

Act. Flt. Lt. K. J. GORDON, D.F.C., R.A.F.V.R., No. 105 Sqn.—This officer commenced operational flying in September, 1940, and has participated in three tours of operational duty. In all his later sorties he has accomplished the duties of target marker with great success. At all times Flt. Lt. Gordon has shown great navigational skill, courage and determination. He has never let either adverse weather or enemy opposition deter him from completing his allotted task.

F/O. C. BRAMELD, D.F.C., R.A.F.V.R., No. 109 Sqn.—This officer has a long and distinguished record of operational flying. He has completed three tours of operational duty, and since the award of a Bar to the D.F.C. he has participated in attacks against some of the heaviest defended targets in Germany. A navigator of outstanding ability, F/O Brameld has never let either intense anti-aircraft fire or adverse weather deflect him from accomplishing his allotted tasks in a cool and efficient manner.

Air Marshal R. V. Goddard, C.B., C.B.E. Air officer in charge of Administration, Air H.Q., India.

Bar to Distinguished Flying Cross

Flt. Lt. P. HALL, D.F.C., R.A.F.V.R., No. 105 Sqn.
Flt. Lt. R. A. LOCATELLI, D.F.C., R.A.F.V.R., No. 109 Sqn.
Flt. Lt. A. McCARTNEY, D.F.C., R.A.F.V.R., No. 166 Sqn.
Flt. Lt. A. P. MOUNTAIN, D.F.C., D.F.M., R.A.F.V.R., No. 109 Sqn.
Flt. Lt. J. NAYLOR, D.F.C., R.A.F.V.R., No. 10 Sqn.
Flt. Lt. J. C. SAMPSON, D.F.C., R.A.F.V.R., No. 105 Sqn.
Flt. Lt. E. M. SMITH, D.F.C., D.F.M., R.A.F.V.R., No. No. 515 Sqn.
Flt. Lt. B. TIERNEY, D.F.C., R.A.F.V.R., No. 105 Sqn.
Flt. Lt. P. J. P. TROTMAN, D.F.C., R.A.F.V.R., No. 692 Sqn.
Flt. Lt. W. WHITEHOUSE, D.F.C., R.A.F.V.R., No. 625 Sqn.
Act. Flt. Lt. J. R. BOWEN, D.F.C., R.A.F.V.R., No. 10 Sqn.
F/O. C. BERNSTEIN, D.F.C., R.A.F.V.R., No. 102 Sqn.
F/O. J. B. MILLER, D.F.C., R.A.F.V.R., No. 460 (R.A.A.F.) Sqn.
F/O. P. H. SPINDLER, D.F.C., R.A.F.V.R., No. 550 Sqn.
P/O. W. L. McGOWN, D.F.C., R.A.F.V.R., No. 162 Sqn.

Distinguished Flying Cross

Wing Cdr. J. L. BARKER, R.A.F.O., No. 625 Sqn.
Sqn. Ldr. W. H. R. WHITTY, A.A.F., No. 640 Sqn.
Act. Sqn. Ldr. J. A. WRIGHT, R.A.F.V.R., No. 169 Sqn.
Flt. Lt. J. LIPTON, R.A.F.V.R., No. 61 Sqn.
Flt. Lt. L. T. A. MERSH, R.A.F.V.R., No. 57 Sqn.
Flt. Lt. V. G. I. OUTEN, R.A.F.V.R., No. 514 Sqn.
Act. Flt. Lt. E. BLANCHARD, R.A.F.V.R., No. 57 Sqn.
F/O. R. M. ELLIOTT, R.A.F.V.R., No. 189 Sqn.
F/O. R. G. HALSTEAD, R.A.F.V.R., No. 10 Sqn.
F/O. C. H. A. KIBTLAND, R.A.F.V.R., No. 427 (R.C.A.F.) Sqn.
F/O. J. REAY, R.A.F.V.R., No. 192 Sqn.
F/O. R. G. W. RICHARDS, R.A.F.V.R., No. 462 (R.A.A.F.) Sqn.
P/O. C. J. McCARTHY, R.A.F.V.R., No. 78 Sqn.
W/O. N. H. BOLT, R.A.F.V.R., No. 218 Sqn.
W/O. E. J. THOMPSON, R.A.F.V.R., No. 49 Sqn.
Act. Flt. Lt. A. C. WINSTON, R.A.A.F., No. 463 (R.A.A.F.) Sqn.
F/O. I. A. FREELAND, R.A.A.F., No. 44 Sqn.
F/O. B. S. NICHOLLS, R.A.A.F., No. 640 Sqn.
F/O. A. R. SULLIVAN, R.A.A.F., No. 460 (R.A.A.F.) Sqn
Flt. Lt. A. L. PEARSON, R.C.A.F., No. 102 Sqn.
Act. Flt. Lt. W. McI MARK, R.C.A.F., No. 425 (R.C.A.F.), Sqn.
Act. Flt. Lt. G. R. PERRIER, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
F/O. G. J. KEEPER, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
F/O. J. A. F. MILLER, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
F/O. A. E. TICCHELAAR, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
P/O. J. H. WAUGH, D.F.M., R.C.A.F., No. 420 (R.C.A.F.) Sqn.
P/O. J. WILKINS, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
Act. Sqn. Ldr. B. S. R. BLENNERHASSETT, R.A.F.V.R., No. 626 Sqn.
Act. Sqn. Ldr. K. F. FLINT, R.A.F.V.R., No. 101 Sqn.
Act. Sqn. Ldr. J. E. HOLLAND, R.A.F.V.R., No. 103 Sqn.

Badge of No. 102 Squadron, R.A.F.—"Tentate et perficite" (Through Trial to Perfection)

Badge of No. 115 Bomber Squadron, R.A.F.—"Despite the Elements."

SERVICE AVIATION

Act. Sqn. Ldr R. A. JELL, R.A.F.V.R., No. 218 Sqn.
Flt. Lt. J. H. CANTON, R.A.F.V.R., No. 514 Sqn.
Flt. Lt. E. E. H. COOK, R.A.F.V.R., No. 10 Sqn.
Flt. Lt. J. I. S. DIGMAN, R.A.F.V.R., No. 44 Sqn.
Flt. Lt. S T. FARRINGTON, R.A.F.V.R., No. 214 Sqn.
Flt. Lt. R. G. GRAY, R.A.F.V.R., No. 192 Sqn.
Flt. Lt. R. N. HARRISON, R.A.F.V.R., No. 90 Sqn.
Flt. Lt. W. J. HUMPHRIES. R.A.F.V.R., No. 514 Sqn.
Flt. Lt. J. F. D. JARMY, R.A.F.V.R., No. 218 Sqn.
Flt. Lt. J. W. LUCAS, R.A.F.V.R., No. 214 Sqn.
Flt. Lt. W. T. MACFARLANE, R.A.F.V.R., No. 76 Sqn.
Flt. Lt. T. NISBET, R.A.F.V.R., No. 170 Sqn.
Flt. Lt. A. V. PARKER, R.A.F.V.R., No. 192 Sqn.
Flt. Lt. D. H. PARKER, R.A.F.V.R., No. 51 Sqn.
Flt. Lt. A. M. RITCHIE, R.A.F.V.R., No. 9 Sqn.
Act. Flt. Lt. C. ARKINSTALL, R.A.F., No. 199 Sqn.
Act. Flt. Lt. Y. LEWIS, R.A.F.V.R., No. 514 Sqn.
Act. Flt. Lt. J. A. SKILTON, R.A.F., No. 189 Sqn.
Flt. Lt. J. A. WAKE, R.A.F.V.R., No. 514 Sqn.
F/O. G. A. ARROWSMITH, R.A.F.V.R., No. 630 Sqn.
F/O. J. BECKETT, R.A.F.V.R., No. 102 Sqn.
F/O. J. BELL, R.A.F.V.R., No. 192 Sqn.
F/O. J. BLACK, R.A.F.V.R., No. 630 Sqn.
F/O. J. BRIGHAM, R.A.F.V.R., No. 223 Sqn.
F/O. G. DUGLAN, R.A.F.V.R., No. 75 (N.Z.) Sqn.
F/O. S. ELLIS, R.A.F.V.R., No. 514 Sqn.
F/O. A. W. HALLETT, R.A.F.V.R., No. 434 (R.C.A.F.) Sqn.
F/O. C. ROBSON, R.A.F.V.R., No. 427 (R.C.A.F.) Sqn.
F/O. W. T. H. WATT, R.A.F.V.R., No. 462 (R.A.A.F.) Sqn.
P/O. J. BULMER, R.A.F.V.R., No. 78 Sqn.
P/O. H. COPLEY, R.A.F.V.R., No. 51 Sqn.
P/O. S. G. WATSON, R.A.F.V.R., No. 75 (N.Z.) Sqn.
P/O. W. E. WISEMAN, R.A.F., No. 514 Sqn.
Act. Wing Cdr. I. H. A. HAY, R.A.A.F., No. 467 (R.A.A.F.) Sqn.
Act. Sqn. Ldr. L. G. SCHARER, R.A.A.F., No. 462 (R.A.A.F.) Sqn.
Flt. Lt. W. R. WILLIAMS, R.A.A.F., No. 83 Sqn.
F/O. D. W. A. PROCTER, R.A.A.F., No. 463 (R.A.A.F.) Sqn.
F/O. J. SAMUELS, R.A.A.F., No. 463 (R.A.A.F.) Sqn.
Flt. Lt. J. H. BOUDREAU, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
Flt. Lt. J. P. GRACIE, R.C.A.F., No. 76 Sqn.
Flt. Lt. R. J. SHERRETT, R.C.A.F., No. 431 (R.C.A.F.) Sqn.
F/O. J. L. GEMMEL, R.C.A.F., No. 78 Sqn.
F/O. W. N. JOY, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
F/O. J. MCCRINDLE, R.C.A.F., No. 514 Sqn.
F/O. L. G. MICHIE, R.C.A.F., No. 550 Sqn.
F/O. J. M. P. O'BRIEN, R.C.A.F., No. 514 Sqn.
F/O. T. McL. ROBERTSON, R.C.A.F., No. 431 (R.C.A.F.) Sqn.
F/O. P. SHAUGHNESSY, R.C.A.F., No. 514 Sqn.
Flt. Lt. T. Y. HICKS, R.N.Z.A.F., No. 192 Sqn.
Act. Flt. Lt. A. B. WHEELER, R.N.Z.A.F., No. 192 Sqn.
F/O. O. L. GOLDSMITH, R.N.Z.A.F., No. 514 Sqn.
F/O. E. R. TAYLOR, R.N.Z.A.F., No. 192 Sqn.
Act. Flt. Lt. H. J. WHITTINGHAM, R.A.F.V.R., No. 15 Sqn.
F/O. F. F. ADLER, R.A.F.V.R., No. 10 Sqn.
F/O. A. ASPIN, R.A.F.V.R., No. 186 Sqn.
F/O. W. S. BAMLETT, D.F.M., R.A.F.V.R., No. 635 Sqn.
F/O. W. D. BARLOW, R.A.F.V.R., No. 44 Sqn.
F/O. W. BATHGATE, R.A.F.V.R., No. 100 Sqn.
F/O. P. C. L. BIRD, D.F.M., R.A.F.V.R., No. 12 Sqn.
F/O. W. BOYES, R.A.F.V.R., No. 640 Sqn.
F/O. F. H. BUSS, D.F.M., R.A.F.V.R., No. 582 Sqn.
F/O. C. W. C. CLIFFORD, R.A.F.V.R., No. 10 Sqn.
F/O. G. COOKE, R.A.F., No. 640 Sqn.
F/O. J. B. CUSHING, R.A.F.V.R., No. 514 Sqn.
F/O. J. DAVIDSON, R.A.F.V.R., No. 78 Sqn.
F/O. V. W. DAVIES, R.A.F.V.R., No. 627 Sqn.
F/O. R. V. DRAKE, R.A.F.V.R., No. 10 Sqn.
Act. Flt. Lt. G. S. GILMOUR, R.A.A.F., No. 622 Sqn.
Act. Flt. Lt. C. W. L. SABINE, R.A.A.F., No. 97 Sqn.
Act. Flt. Lt. J. E. SLAUGHTER, R.A.A.F., No. 15 Sqn.
F/O. C. A. BENDER, R.A.A.F., No. 15 Sqn.
F/O. C. J. CHALLIS, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
F/O. H. P. GILLIS, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
F/O. T. A. GUMMERSALL, R.A.A.F., No. 467 (R.A.A.F.) Sqn.
F/O. E. T. HARDMAN, R.A.A.F., No. 214 Sqn.
F/O. L. F. LOVELOCK, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
F/O. J. W. MCCARTHY, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
F/O. A. MCK. MCDONALD, R.A.A.F., No. 158 Sqn.
F/O. A. W. BALLARD, R.C.A.F., No. 83 Sqn.
F/O. G. C. BRUSH, R.C.A.F., No. 415 (R.C.A.F.) Sqn.
F/O. E. F. BUSH, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
F/O. J. H. CORSBIE, R.C.A.F., No. 626 Sqn.
F/O. L. E. DOLL, R.C.A.F., No. 166 Sqn.
F/O. R. J. FERNIHOUGH, R.C.A.F., No. 408 (R.C.A.F.) Sqn.
F/O. C. G. FISET, R.C.A.F., No. 514 Sqn.
Act. Wing Cdr. L. E. BOTTING, R.A.F.V.R., No. 49 Sqn.
Act. Wing Cdr. E. G. SCOTT, R.A.F.O., No. 90 Sqn.
Act. Sqn. Ldr. J. A. BRIGNELL, R.A.F.V.R., No. 622 Sqn.
Act. Sqn. Ldr. A. B. FRY, R.A.F.V.R., No. 625 Sqn.
Act. Sqn. Ldr. R. D. GRAY, R.A.F.V.R., No. 90 Sqn.
Act. Sqn. Ldr. P. S. HUGGINS, R.A.F.V.R., No, 12 Sqn.

Distinguished Flying Medal

Flt. Sgt. (now P/O.) D. H. SHORTER, R.A.F.V.R., No. 622 Sqn.
Flt. Sgt. A. P. THOMAS, R.A.F.V.R., No. 149 Sqn.
Flt. Sgt. L. R. THORNLEY, R.A.F.V.R., No. 90 Sqn.
Flt. Sgt. (now P/O.) A. WATT, R.A.F.V.R., No. 101 Sqn.

THE KING has been graciously pleased, on the advice of His Majesty's Canadian Ministers, to approve the following awards.

O.B.E. (Mil.)

Flt. Lt. P. N. HIGGINS, R.C.A.F.

George Medal

P/O. H. V. MCLEAN, R.C.A.F.

B.E.M. (Mil.)

A/C.1 W. F. NIGHTINGALE, R.C.A.F.

Roll of Honour

Casualty Communiqué No. 556.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list, 247 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. G. G. Cockroft; Flt. Sgt. J. L. M. P. Gheysens; P/O. W. H. V. Mackay; P/O. R. L. McKinney; Sgt. E. N. Oddy; Flt. Lt. D. K. Thorburn, D.F.C.; Flt. Sgt. E. Wood.

MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. S. W. Piner.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. J. H. Boocock; Sgt. C. E. Dunlop; F/O. D. F. Hart; Flt. Sgt. W. F. Hircock; Sgt. J. L. Mitchell; Sgt. S. D. Starbuck; Sgt. J. Sullivan; P/O. G. E. Turton; W/O. R. P. Wilson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. W. Abbott; Sgt. J. A. Atkins; F/O. W. Airs; Sgt. A. P. Allen; Sgt. F. N. Allen; F/O. E. W. H. Barker; Flt. Sgt. P. S. Barton; Flt. Sgt. F. W. W. Beckwith; F/O. R. H. Beer; Sqn. Ldr. C. B. Best, D.F.C.; F/O. H. Blenkinsop; F/O. B. J. Boston; Sgt. K. Boulger; P/O. A. L. Brett; Flt. Sgt. A. S. H. Brown; Act. Sqn. Ldr. R. W. Brown, D.F.C.; Sgt. H. J. Browne; Sgt. D. Burden; P/O. A. W. A. Burnell; Flt. Lt. E. C. Burt, D.F.C.; Sgt. A. W. Burton; Flt. Sgt. D. Burton; Sgt. P.

R.A.F. WAR COMMANDERS

Air Chief Marshal Sir Frederick Bowhill

Caricature portrait by Hayden

AIR CHIEF MARSHAL SIR FREDERICK BOWHILL, C.B.E., K.C.B., C.M.G., D.S.O. and bar, has had a career which was not only distinguished; it was unusual. Very briefly summarised, it was: The Merchant Service, the Royal Naval Reserve, the Royal Navy, the Royal Naval Air Service, the Royal Air Force.

Born in India in 1880, he was educated at H.M.S. *Worcester*, the training ship which has given many distinguished officers to the Merchant Navy and the Royal Navy. Bowhill joined the Merchant Navy, and also received a commission in the R.N.R. In January, 1913, he learnt to fly, and after passing through the C.F.S. he was made a supplementary Lieutenant in the Royal Navy, being posted to Eastchurch as a flying officer. When the first world war broke out in 1914 he was given command of H.M.S. *Empress*. Then he served in the Air Department at the Admiralty for a time, but in 1916 he was sent to Iraq, and soon after to East Africa. There he was in command of No. 8 Seaplane Squadron, and took part in Gen. Smuts' operations against the Germans in Tanganyika. For his services in that campaign he was made a Companion of the Distinguished Service Order.

After the Armistice he was given a bar to the D.S.O., was made a C.M.G., and also received Russian and Greek decorations. In 1919 he served in the Ægean and at Constantinople. There followed a number of R.A.F. appointments, and attendance at the Senior Officers' War Course at Greenwich.

In 1931 he was appointed A.O.C., Fighting Area, then a part of the Command, Air Defence of Great Britain, and was promoted over the heads of several senior officers to be Air Vice-Marshal. At the outbreak of the second world war he was A.O.C.-in-C., Coastal Command. From that he was transferred to be A.O.C.-in-C. of what is now Transport Command. In every position which he has held Sir Frederick has won distinction, and has been popular with all who have worked with him. Physically his distinguishing feature is his eyebrows.

SERVICE AVIATION

Cameron; Flt. Sgt. S Cater; Sgt. M. Charlish; Flt. Sgt. M. A. Clark; Flt. Sgt. R. Clark; Flt Lt. S. E. C. Clark; Sgt. E. L. Connett; Sgt. F. Cooney; Flt. Sgt. E. Cornish; Sgt. J. Coulter; Flt. Lt. A. J. Craven; F/O. F. Crosier; Sgt. J. D. Cumming; F/O. G. Daniel; Flt. Sgt. D. T. Davidson; Sgt. D. A. Dawson; Flt. Sgt. N. J. De La Haye; Sgt. F. Dickinson; Flt. Sgt. H. Dickinson; F/O. H. Dodds; Flt. Sgt. C. W. Dovey; Sgt. E. R. Duckworth; W/O. P. Duff; Sgt. E. D. Eaton; Flt. Sgt. T. R. Edgell; Sgt. W. A. Edwards; F/O. D. J. Faires; Flt. Sgt. J. Findlay; Flt. Lt. J. D. Fox; F/O. D. J. Fricker; F/O. G. B. Gingell; P/O. E. G. Gittings; Flt. Sgt. J. W. Green; Sgt. N. W. Green; Flt. Sgt. G. F. Griffiths; Sgt. G. W. Habgood; Sgt. A. F. Hall; Flt. Lt. A. J. Hancock, D.F.C.; F/O. W. Hannah, D.F.C.; Sgt. J. Hare; Flt. Sgt. G. F. J. Harris; F/O. M. G. Harrison; Flt. Sgt. R. T. Harrison; Act. Sqn. Ldr. S. W. Hart; Flt. Sgt. J. D. Harvey; Sgt. A. D. Hawkins; P/O. J. Hembry; Flt. Lt. E. K. Heywood; Sgt. N. H. Hodson; F/O. R. H. Holmes; Sgt. W. A. Holt; P/O. L. Hunt, D.F.C.; Sgt. B. I'Anson; Act. Sqn. Ldr. G. F. H. Ingram; Flt. Sgt. S. Isherwood; P/O. D. S. Jackson; Flt. Sgt. L. F. Jackson; P/O. W. Jardine; Flt. Sgt. J. F. Jenkins; Flt. Sgt. E. A. Johnson; F/O. A. V. M. Jones; Sgt. T. M. Jones; Sgt. C. E. Judge; Sgt. A. M. Kean; Flt. Sgt. A. G. A. Keenor; Sgt. G. E. Kemp; Sgt. F. B. G. King; P/O. K. G. Kingerlee; Sgt. E. R. S. Kirby; Sgt. A. Laidlaw; Sgt. J. Langton; Sgt. K. E. Laxton; Flt. Lt. T. G. Leggett; Sgt. G. G. Leighton; Act. Sqn. Ldr. J. J. Le Roux, D.F.C.; Sgt. H. A. Lewarne; Flt. Sgt. M. Lewin; P/O. E. F. Lewis; W/O. W. J. Lilly; Flt. Sgt. I. G. Lqng; Sgt. D. E. Lyne; Sgt. J. M. McCarthy; Sgt. A. B. McGlynn; Flt. Sgt. J. A. McKillop; Sgt. R. McLean; Sgt. P. B. McRann; Sgt. H. Maltby; F/O. R. K. Marshall; F/O. A. G. Maskall; Sgt. A. Mason; F/O. F. E. Mitchell; Sgt. J. Moffat; P/O. D. Moffat-Wilson; P/O. E. W. Morgan; Sgt. M. F. Morgan; Sgt. F. Morton; Sgt. A. Moss; Sgt. A. Moult; Flt. Sgt. P. M. Murphy; Sgt. F. W. Niblett; Act. Flt. Sgt. R. Nixon; Flt. Sgt. D. O'Beirne; Sgt. S. C. Orrell; Flt. Sgt. A. G. Otton; Act. Flt. Lt. W. E. Palmer, Flt. Lt. H. Pearson; Sgt. M. S. Pegler; Sgt. K. Penton; Sgt. A. C. Perkins; Flt. Sgt. L. E. G. Pester; Flt. Sgt. G. E. Platt; P/O. R. H. Porter; Flt. Sgt. A. S. Price; Flt. Sgt. F. S. Rawson; F/O. G. D. Rees; Sgt. C. G. Reeve; P/O. T. B. Richards; W/O. A. J. Richardson; Flt. Sgt. G. W. Roach; W/O. E. C. Roberts, D.F.M.; P/O. L. Robin; Sgt. A. E. J. Rouse; Flt. Sgt. J. Rumney; Sgt. K. W. Saxton; P/O. N. H. W. Scholtz; Flt. Lt. B. E. Scott; Flt. Lt. L. Shackman, A.F.C.; Sgt. A. Shaw; W/O. H. Shaw; Sgt. F. B. Sheard; Act. Flt. Lt. J. Skingley; Flt. Sgt. K. J. Skinner; Sgt. C. H. Slater; P/O. A. L. Slatter; Sgt. K. H. Spiers; Sgt. G. J. Spillman; Act. F/O. R. L. Stanley; Sgt. E. E. Stapley; Sgt. G. L. Startin; Flt. Sgt. G. W. Steele; F/O. S. J. Stott; Act. Sqn. Ldr. A. Sudden, D.F.M.; Flt. Sgt. W. A. Sumner; Sgt. G. Taylor; F/O. J. A. Tebbut; Sqn. Ldr. R. H. Thompson; Flt. Sgt. C. J. Trott; Act. Flt. Lt. C. R. Underhill; Flt. Lt. M. G. Wakefield; Flt. Sgt. H. Waller; Sgt. G. F. Walton; Flt. Sgt. J. T. Ward; F/O. H. J. Watts; F/O. D. A. Weatherhill, D.F.C.; P/O. R. J. West; Sgt. R. S. D. Wharton; P/O. J. White; Sgt. L. G. White; P/O. K. N. Wiggins; F/O. D. K. Williams, D.F.C.; P/O. G. M. Williams; Flt. Lt. J. I. Williams; Sgt. R. Wills; F/O. D. Wilson; Flt. Sgt. T. J. C. Wilson; Sgt. R. Wolsey; P/O. K. I. Wood; Flt. Sgt. L. W. Woodard, D.F.M.; F/O. W. Woodward.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Sgt. W. B. Gladstone; F/O. W. G. Hardcastle; Sgt. D. L. Karck; Sgt. P. S. Kidd; Sgt. I. L. Murdoch; Flt. Sgt. N. S. Scott; Flt. Lt. R. U. Williams.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. A. H. Clark.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. F. W. Priest; Flt. Sgt. T. E. P. Rosenthal.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. G. N. Grant; Sgt. R. K. Kelsey; F/O. J. H. Vines; F/O. P. T. Wansbrough.

MISSING.—F/O. R. W. Anderson; Flt. Sgt. A. A. Bradley; Sgt. F. T. Chambers; F/O. E. Davies; Flt. Sgt. D. Greenwood; Flt. Sgt. J. Loth; Sgt. E. W. Norman; W/O. R. H. A. Pool.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. R. A. Adams; Sgt. J. A. Bell; Sgt. J. Blair; F/O. L. F. Blanks; Sgt. A. Davies; F/O. A. E. Davis; F/O. F. C. Fortune; W/O. M. O. Graver; F/O. B. Hall; Flt. Sgt. R. G. Holloway; F/O. G. Lauder; Flt. Sgt. L. W. Maunder; F/O. V. F. D. Meade; F/O. R. J. O'Donnell; Cpl. R. W. Pearce; Sgt. G. L. Rabbetts; Flt. Sgt. W. C. Ralphs; Sgt. J. A. Sills; Sgt. R. H. Smith; Flt. Sgt. H. Sorrell; Sgt. V. R. W. Southworth; Flt. Sgt. F. N. Storer; Sgt. R. H. Taylor; F/O. R. F. Thompson; F/O. T. F. Thompson.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. A. Bird; Sgt. D. H. Harding; Sgt. R. H. Stoner.

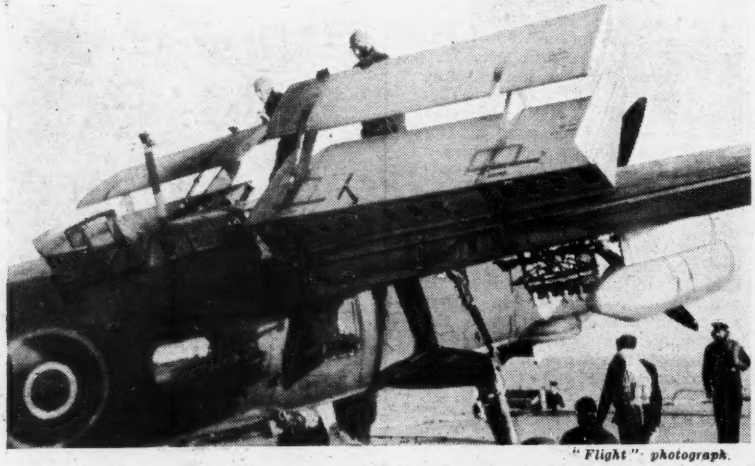
PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—W/O. R. W. Cheetham; Flt. Sgt. E. F. Craddock; A/C.1 J. H. Ferguson; L.A/C. J. Gaughan; Cpl. G. Logan; L.A/C. R. J. Peckham; Sgt. E. T. Rees; A/C.1 T. C. Rolt; Act. Sgt. N. W. Salmon.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. G. A. Fuller; AIC.2 R. C. Lloyd; P/O. K. A. D. Newman.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. R. P. Adams.

DIED ON ACTIVE SERVICE.—F/O. J. B. W. Bower; F/O. J. L. Brebner; A/C.1 F. D. Byfield; L.A/C B. V. Dalton; A/C.1 G. E. Draper; Flt. Sgt. A. R. Eaton; A/C.1 W. A. Evans; L.A/C. W. A. Farley; A/C.1 P. J. Foley; L.A/C. S. Goby; L.A/C. C. R. Godfrey; L.A/C. R. H. Hywood; L.A/C. J. Ireson; F/O. L. K. Large; A/C.2 D. A. Lee; L.A/C. A. E. Lockyer; P/O. D. I. Morgan; L.A/C. L. S. G. Morton; L.A/C. K. Moss; Cpt. A. Payne; Flt. Sgt. C. H. A. Pindar; L.A/C. J. T. Reid; L.A/C. S. Ross; A/C.1 V. R. Shead; L.A/C. S. T. Smith; L.A/C. W. G. Sones; Flt. Sgt B. W. M. Van Leeuwen; Flt. Sgt. F. Wesley.

EYES OF THE FOURTEENTH : Pilots and ground crews of No. 681 Squadron, R.A.F., which operated throughout the whole Burma campaign, supplying photographic information for the Fourteenth Army.



"Flight" photograph.

Wing-folding mechanisms provide many problems for designers, a fact well illustrated by this photograph, showing the first stage in folding the wings of a Fairey Barracuda.

Royal Australian Air Force

KILLED IN ACTION.—P/O. P. R. Arscott; Flt Lt. C. W. Wheelock.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. W. M. Barbour.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. R. J. Birtles; Flt. Sgt. K. J. Campbell; Flt. Sgt. R. H. Curner; Act. Flt. Lt. G. H. Drewer; Flt. Sgt. S. L. Edwards; Act. Flt. Lt. J. A. Forrest; F/O. G. O. Jones; P/O. C. A. McCarthy; Flt. Sgt. D. K. McDonnell; Flt. Sgt. J. McLeod; Sqn. Ldr. J. F. McMullan; W/O. C. B. Manning; Flt. Sgt. I. E. Martin; P/O. D. W. Mason; Flt. Sgt. K. S. M. Mitchell; Flt. Sgt. T. D. Murray; Act. Sqn. Ldr. A. G. Oxlade; Flt. Sgt. A. S. Parsons; F/O. A. O. Peters; Act. F/O. E. F. Reid; P/O. R. E. S. Shearer; Flt. Sgt. N. L. Sorensen; Flt. Sgt. J. G. Stewart.

KILLED ON ACTIVE SERVICE.—F/O. R. P. Terpening, D.F.C.; W/O. A. P. Underwood; P/O. J. G. Watson, D.F.M.

WOUNDED OR INJURED ON ACTIVE SERVICE.—P/O. A. W. McIlrath, D.F.C.

Royal Canadian Air Force

KILLED IN ACTION.—F/O. E. I. Ford; F/O. M. A. Parker.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sqn. Ldr. D. G. MacK. Joy.

MISSING, BELIEVED KILLED IN ACTION.—F/O. G. F. Burden; F/O. J. D. A. Robertson, D.F.C.

MISSING.—F/O. P. J. Baker; F/O. G. W. Bouck; F/O. W. T. De Marco; W/O. N. H. Johnston; F/O. C. A. Lee; Flt. Lt. M. S. McClarty, D.F.C.; Flt. Lt. P. M. Pieri; W/O. G. V. Walker; F/O. D. B. Young.

KILLED ON ACTIVE SERVICE.—Sgt. S. R. B. Douglas.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Act. F/O. T. G. Page; Flt. Sgt. A. T. Stone; P/O. B. F. Wallis.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. R. F. Carrolus; Act. F/O. C. J. Evans; Flt. Sgt. I. J. Loveridge, Flt. Sgt. T. R. Thwaite.

South African Air Force

MISSING, BELIEVED KILLED, NOW PRESUMED KILLED IN ACTION.—Capt. P. J. S. Louw.

MISSING, NOW PRESUMED KILLED IN ACTION.—W/O. S. J. Nienaber; Lt. G. H. Richardson; W/O. C. P. Weitz

945

ron,
oto-

. Rees;
VICE.—
; P/O.

VED ON

B. W.
Byfield;
r; Flt.
L.A/C.
/C. S.
R. H.
Large;
; P/O.
L.A/C.
H. A.
Ross;
L.A/C.
euwen;

rce
t; Flt.

LIEVED
LED IN

PRE-
R. J.
R. H.
t. Sgt.
; F/O.
t. Sgt.
n. Ldr.
lt. Sgt.
t. Sgt.
; Act.
arsons;
; P/O.
n; Flt.

P. Ter-
; P/O.

VICE.—

rce
F/O.

VED IN

—F/O.
F.C.
G. W.
John-
Clarty,
G. V.

R. B.

orce
PRE-
T. G.
allis.
R. F.
I. J.

e
SUMED

TION.—
rdson;